AGRICULTURAL CHEMICALS

AGRICULTURAL INSECTICIDES • FUNGICIDES • STOCK DIPS AND SPRAYS
FUMIGANTS • DAIRY FARM CHEMICALS • WEED CONTROL CHEMICALS • FERTILIZERS
SOIL TREATING MATERIALS • SEED TREATING CHEMICALS • RODENTICIDES

Volume II May, 1947 Number 5

For "HARD-TO-KILL" WEEDS
Get Baker's 2,4-D Formulation #5

One of several formulations for weed problems. In bulk—ready for packaging and your label!

Woody plants, mature weeds and some broad-leaved weeds are somewhat resistant to the usual forms of 2, 4-D.

These "hard-to-kill" weeds—and re-growth from previously cut woody plants—present a special problem in clearing fence rows, pastures, sod waterways, ditch banks, power-line rights-of-way, terrace outlets, irrigation ditches, etc.

Most of this growth yields, however, to Baker's 2, 4-D Formulation #5.

Without affecting erosion-controlling grasses, Baker's Formulation #5 controls such weeds and woody plants as poison ivy, willows, buck-brush, sumac, elderberry, boxelder, ragweed, wild onion, bindweed, etc.

Baker's Formulation #5 is a liquid concentrate, ready for dilution by the consumer.

You can get Baker's 2, 4-D Formulation #5 in bulk ready for packaging and your label. If you sell weed killers—don't overlook this important segment of your market.

We will be glad to send prices and further information at your request. Write to *Agricultural Chemical Division*, J. T. Baker Chemical Co., Executive Offices, Phillipsburg, N. J.

OTHER BAKER'S 2, 4-D FORMULATIONS

To meet the particular weed-killing requirements in your territory—the type of equipment used for application—your packaging and distribution problems—Baker can supply you with various 2, 4-D formulations.

You may wish an all-purpose weed killer, or a specific. You may want a formulation for large scale or small operations... for pastures, or growing crops... for application by airplane, fog-sprayers, or other special machinery.

You may prefer a powder or liquid concentrate that will yield either a clear solution or a creamy, stable emulsion. Whatever your needs, ask Baker for the proper formulation for the job. Write to the J. T. Baker Chemical Co.

Baker's Chemicals

C. P. ANALYZED • FINE • INDUSTRIAL

Codling Moth

Carpocapsa pomonella L.

(Reproduced by permission from "Insect Pests of Farm, Garden and Orchard" by Prof. L. W. Peiars, published by John Wiley and Sons, Inc.)

SANTOBANE

(MONSANTO DDT)

The codling moth is one of many pests that are successfully controlled with formulations containing Santobane.* Santobane is a uniform, free-flowing, granular material that can be easily solubilized, emulsified or milled.

Santobane is an established Monsanto product. While present supplies are not equal to demands, production will be increased as soon as raw materials become available in sufficient quantities.

Inquiries concerning properties and uses of Santobane will receive prompt attention . . . MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

*Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS AND PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

Leaving in the past old-fashioned manure-spreading methods of fertilization, this more modern device spreads commercial fertilizer material over fields. Scenes like this multiplied the world over, explain how the fertilizer industry is attaining its full stature.

MAY, 1947
VOL. II No. 5

A Monthly Magazine For the Trade

In This Issue:

AGRICULTURAL CHEMICALS

Subscription Rates: *One year* $3.00, *two years* $5.00. *Outside U. S. one year,* $4.00.

Published monthly on the 15th by Industry Publications, Inc. Office of Publication, 123 Market Place, Baltimore 2, Md. Advertising and editorial office, 254 W. 31st St., New York, 1, N. Y. Advertising rates made known on application. Closing date for copy—25th of the month previous to date of issue.

Entered as Second Class Matter at the Post Office at Baltimore, Md., under the Act of March 3rd, 1879.

We're Happy to Announce . . .

Attaclay WILL NOT WEAR WELL

By this we mean that laboratory and other comparisons of Attaclay-extended dusts indicate their lack of abrasiveness—which means insignificant wear on dusting equipment. But, because of this very quality, and all that it means to trouble-free dusting and longer rig-life, Attaclay *will* "wear well" with its users. Here's a diluent where—as with comfortable slippers—appreciation will grow through use.

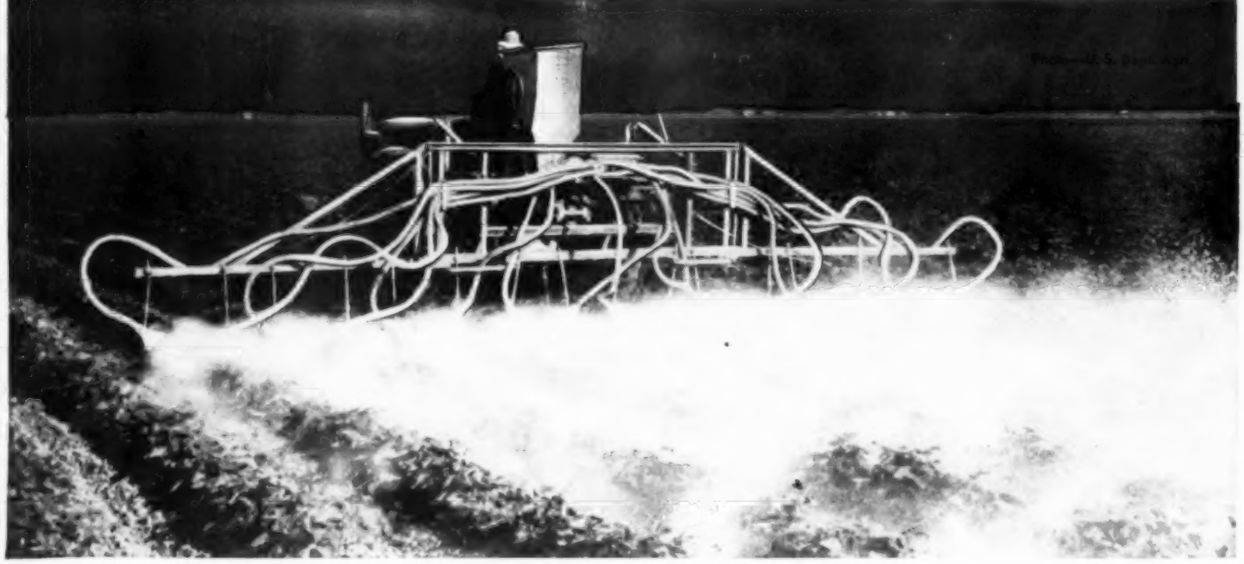
Take the eight-row rig illustrated. Sixteen hoses and nozzles—innumerable bends—all, are friction points. It's further likely that impeller clearances are close. In such typical rigs, Attaclay's lack of abrasiveness should spell S-A-V-I-N-G-S in time, parts, money.

Then, there's *flowability!* Attaclay-extended dusts travel loosely and freely from hopper to nozzle—flow smoothly through the nozzle. And this same lump-free state exists where dusts are liquid-impregnated or oil-conditioned.

Other "wear well" features? Low bulk density that suggests greater coverage per pound of dust. Particle size that promotes proper dust dispersion. Desirable characteristics as regards adherence to host. Well-established breadth of chemical compatibility.

If your dust program calls for the blending or applying of insecticides, fungicides, herbicides, defoliants, fertilizers, soil fumigants, plant hormones, etc., then use or specify Attaclay as the diluent. It'll probably "wear well" with you and your over-all dusting success.

ATTAPULGUS CLAY COMPANY
DEPT. P, 260 SOUTH BROAD ST., PHILADELPHIA 1, PA.



Small wonder Pappy kicked Hezzy through the old South barn. Hez drove all the way to town for supplies and forgot the most important pickup of all—the Orbiscide Insecticide Concentrates Pappy had ordered from the local dealer.

"Mad?" said Pappy. "Thought I'd split a gusset when he tole me he'd forgotten 'em. I got stock dips to make, dust to mix and I even wanted to whitewash the cow barn with DDT. That no-account critter knew I needed 'em Orbiscides, too."

Well, you'd be mad too if you had to do without Orbiscide Insecticide Concentrates even for one day. That's why it will pay you to keep well stocked with Orbiscides. It will pay you, too, to keep up with the latest developments from the Orbis research laboratories. Investigate these Orbis products today.

ROTENONE ORBISCIDE CONCENTRATES

Cube Resins—with definite rotenone content.
Cube Powder—4 - 5% Rotenone.
5% Rotenone Oil Concentrate.

DDT ORBISCIDE CONCENTRATES

25% DDT Emulsifiable Concentrate.
30% DDT Oil Concentrate.
DDT plus Rotenone Emulsifiable Concentrate.
50% DDT Wettable Powder Concentrate.
50% DDT Superfine Powder Concentrate.

Write, wire or phone for complete information and samples. Let us solve your insecticide problems. No obligation.

INSECTICIDE SALES DIVISON

COSMETIC RAW MATERIAL
WATER SOLUBLE GUMS
FOOD COLORS

PERFUME BASES
ESSENTIAL OILS
FRUIT FLAVORS

QUINCE SEED
OLEO RESINS
STEARIC ACID

ORBIS PRODUCTS CORPORATION
215 PEARL STREET, NEW YORK
FACTORY AND LABORATORY, NEWARK, N. J.

WAXES
THYMOL
AROMATICS

CHICAGO PHILADELPHIA MEXICO, D.F BOSTON LOS ANGELES MEMPHIS, TENN.

2, 4-D
WEED KILLER

2, 4-D Weed Killer has proven itself a new weapon of great effectiveness in the control of weeds. It is both economical and practical to use.

Home owners are finding it saves long hours of tedious weed pulling without harming the grass . . . farmers find it the most effective method of eradicating weeds in fence rows, pastures and fields. One or two sprayings during the summer months will effectively control weeds at a big saving in labor costs.

Available in 8 oz., 16 oz., quart, gallons and 55 gallon drums. 10%, 20%, 30% and 40% concentrations. Packaged under your own label or shipped in bulk quantities. Write today for our LOW PRICES.

Pine Oil
DISINFECTANT

Nothing can compare to the fresh, clean odor and spicy fragrance of our Pine Oil Disinfectants! Manufactured from purest soaps and steam distilled pine oil, they impart a pleasant "piney" odor wherever used . . . in the home, livestock and animal quarters, dog and cat hospitals . . . anywhere cleanliness and absolute sanitation are desired.

Sparkling clear concentrates that form creamy white emulsions in water. Each formulation complies fully with the U.S. Bureau Standard of Specifications.

Phenol Coefficient 3 to 6 inclusive. Available in bulk or under your own private label. Write today for generous samples and prices.

Baird's

AGRICULTURAL DIVISION

BAIRD & McGUIRE, Inc.

ST. LOUIS, MO. HOLBROOK, MASS.

OCTA-KLOR *Relief Map*

for Grasshoppers 1947

The map tells a graphic story of the grasshopper infestation expected during the coming summer. OCTA-KLOR has been found to give complete relief from the huge destruction caused by this pest — turning economic loss to profit. As little as one-half to one pound of OCTA-KLOR per acre gives complete control of grasshopper infestations.

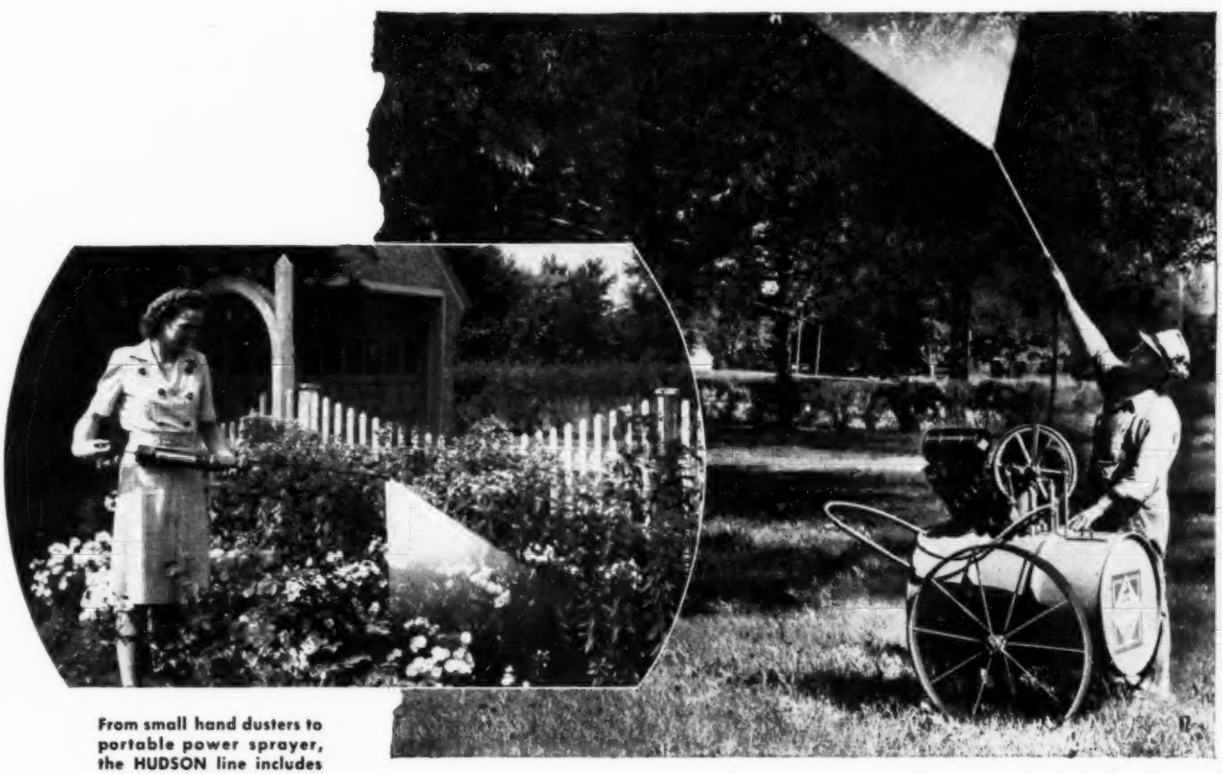
OCTA-KLOR is available in Refined and Agricultural grades, in finished and semi-finished insecticides from The Dow Chemical Co., U. S. Rubber Co., (Naugatuck Chemical Division) and other leading formulators. For further information write—

JULIUS HYMAN & COMPANY

DENVER, COLORADO

Eastern Sales Office: **11 West 42nd Street, New York 18, N. Y.**

THE *Right* SPRAYER or DUSTER FOR EVERY NEED



From small hand dusters to portable power sprayer, the HUDSON line includes equipment for every spraying or dusting job.

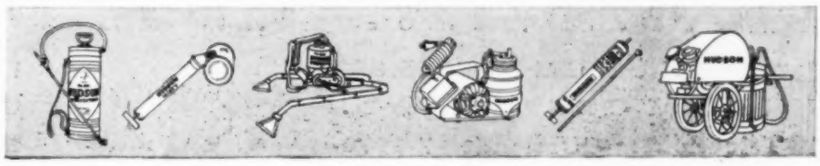
Efficient application—putting the *right amount* in the *right places*—that is the purpose for which every HUDSON sprayer or duster is designed. And to insure efficient application for all users, everywhere, HUDSON makes sprayers and dusters of every type —from small units for household use to large capacity units for commercial use. All types are built for easy operation, which encourages *more frequent* application. All types are designed for long service life, reducing the cost over the long term.

Whether your interest is the *sale* or the *use* of sprayers and dusters, depend on the HUDSON "Diamond-H" line for greatest success.

HUDSON

Tested and Proved
SPRAYERS AND DUSTERS

H. D. HUDSON MANUFACTURING COMPANY
589 East Illinois Street, Chicago 11, Illinois
Branches in all Principal Cities in U. S.



PENICK INSECTICIDAL BASES...

Sure does Knock 'em Down and Knock 'em Out

Impregno is packed in handy-sized metal drums containing 100 pounds each. We recommend that large users of Powdered Pyrethrum Flowers investigate the merits of Impregno.

The men who work the fields are aware of the need for potent insecticides in their never-ending fight against pests. Those men know that Penick insecticidal bases give them full KNOCK-DOWN and KNOCK-OUT POWER without scorch or injury to their crops.

S. B. PENICK & COMPANY offer a dependable product for a majority of your needs. IMPREGNO ...a unique development in PYRETHRUM application as an insecticide is the use of clay impregnated with Pyrethrum Extract. The Pyrethrins content of Impregno is 2%. IMPREGNO is effective because the Pyrethrum Extractives are coated on the outside and not locked in the natural powdered Pyrethrum flowers. Tests on large acreages of cabbages, cranberries, beans, mushrooms and wherever Pyrethrum is applied as an agricultural dust, demonstrate its potency. IMPREGNO is economical...when emulsified the oil globules are so finely divided that they spread evenly over the foliage, and when used as directed give no burn.

30% DDT AGRICULTURAL EMULSIFIABLE is made from technical DDT, 89° setting point.

50% DDT DISPERSIBLE POWDER... for household, agricultural and live stock dusts.

EMULSIFIABLE PYREXCEL 80: a water-based concentrate for the control of soft-bodied insects such as aphids, and leaf hoppers. Excellent for greenhouses.

Write for descriptive literature covering our full line of Insecticidal Bases.

S. B. PENICK & COMPANY

50 CHURCH STREET
NEW YORK 7, N. Y.
Telephone: COrtlandt 7-1970

735 W. DIVISION ST.
CHICAGO 10, ILL.
Telephone: MOHawk 5651

THE EDITOR COMMENTS

THE purpose of the suggested model state insecticide bill drafted by the Council of State Governments and endorsed by manufacturers and associations in the field was obviously to arrive at uniformity in control measures throughout the country,—insuring adequate protection to the public, while freeing manufacturers and sellers of the controlled products from the necessity of operating under the terms of varying and often conflicting rules. The model bill was an important step in the direction of uniformity.

This end is rapidly being defeated, however, by the growing number of state bills which depart in one or more important respects from the suggested model. A particular case in point is the new Michigan measure which carries a number of features deviating widely from the model bill. This proposal gives no alternate labeling provision, has no provision for registration under protest (registration can be either denied or cancelled), and assesses a fee of $15 per product with no limit on the charge to any one company. The latter means that in the case of a manufacturer having a hundred products which he wishes to market in Michigan, the cost would be $1,500 annually. If he had more products, it would still be $15 per product.

Such a measure as this is a definite step in the wrong direction. The excessive fees may serve to keep off the Michigan market many products essential for effective pest control in the State. Should other states adopt similar fee schedules, a burden of several million dollars a year could well be added to the farmer's annual insecticide bill, for in the final analysis all such fees must be passed along to be paid by the eventual user.

The industry should continue to oppose such state bills which point backward in the direction of confusion and non-uniformity. The proposed model bill was the product of the mature thought of the best informed minds in government and industry. The uniformity which it was intended to achieve should not be abandoned without a struggle.

THE fact that the fertilizer industry is capable of meeting all of the plant food needs of agriculture is indicated in production records which show February's output of superphosphate to be the highest in five years. Clifton A. Woodrum, president of the American Plant Food Council, in commenting on the 10 percent increase over last year's corresponding period, says that further increases in output are anticipated as rapidly as building materials, transportation and machinery become available.

Significantly, the greatest expansion of superphosphate consumption is in the middle west, long regarded by the industry as a relatively poor prospect for chemical plant food sales. However, demand for higher production per acre, plus the inevitable lessening of natural fertility of soil through years of use, combine to make superphosphate and other fertilizer materials desirable and necessary.

The present unprecedented demand for fertilizer offers an entirely new experience for manufacturers, most of whom had pre-war plant capacities about 50 percent greater than needed to furnish the fertilizer and other materials that farmers would purchase.

Persons advocating Government control of the fertilizer industry to meet emergency demands should look again at the production figures of private industry. Such records speak eloquently in their own defense!

WHENEVER anything goes wrong with an orchard or a crop which has recently been sprayed or dusted, the insecticide or fungicide is invariably tabbed *per se* as the cause of the trouble. In agricultural communities, this sequence of events never seems to fail. Local rumors, tales and whisperings can damn any agricultural chemical product faster than a wink. Especially if the product happens to be something new or

a new adaptation of an old product,—and often in spite of the definite advice of experiment station or county agent,—growers sometimes show an almost superstitious fear. And their quick readiness to blame the chemical, irrespective of other factors, is probably common the country over.

Last season, one section of his tomato crop was treated by a small grower with a "starter" solution upon planting. The plants wilted badly and remained so for about two days, but thereafter did exceedingly well, and in a matter of weeks were considerably ahead of untreated plants. The treated plants bore earlier and in better volume and quality. And only then did the local whisperings and tales cease,—while during the forty-eight hours of the bad initial wilt, the wagging tongues and knowing nods spread their story of dangerous chemicals and crop damage.

So what is the answer? The same as it has been for the past fifty years,—education and more education. Another obstacle which the agricultural chemical industry must level, particularly among smaller growers and orchardists, in its forward progress.

WHEN some 2,500 tons of ammonium nitrate awaiting shipment to France for fertilizer use exploded at Texas City last month and started what was eventually the virtual destruction of that city, the fear immediately arose that quick action to restrict the shipment and storage of this vitally needed fertilizer material might follow. There is still no certainty that some zealous legislators may not seize this opportunity to make the newspapers,—even though over the years we can remember no other serious explosion or fire involving this chemical.

Although we would not care to be involved with a large quantity of ammonium nitrate in a fire, we believe that the record of this material over the years, in handling, shipment and storage, tab it as relatively safe under present regulations. In spite of the terrible calamity at Texas City, the part which the nitrate played could have been that of any number of other materials under similar conditions. If the unfavorable publicity might hinder its usefulness to agriculture, this would indeed be unfortunate.

CUSTOM spraying of orchards, shade trees, and various row and field crops is growing. More individuals and firms are entering the field, some of whom are well versed in what they are doing, and others, unfortunately, who are not. And it is these latter who worry county agents, experiment station personnel, and insecticide and fungicide manufacturers, blenders, and distributors. Although the growth of custom spraying is welcome as an adjunct to wider and more effective plant disease and insect control, and to increased use of insecticides and fungicides, the uninformed commercial spray man is potentially dangerous as a possible doer of irreparable damage,—not only to the trees or crops which he sprays, but to the maker and distributor of the materials which he may use incorrectly.

Local government authorities and experiment stations are quite conscious of this problem. There has even been talk in some states of licensing commercial spray firms as a safety control measure. Obviously, the custom sprayer must know exactly what he is doing and must be completely familiar with the materials he is using. Local government agents cannot be consulted too often. Upon the shoulders of the dealer, mixer, distributor, co-op, there rests at least a part of the responsibility to warn and to advise those new to the business before they so much as spray their first tree, to urge that they consult competent authority and that they study and follow manufacturers' and dealers' instructions.

FROM various parts of the country we get reports of new restrictive measures designed to control the operations of custom sprayers and to prevent damage from drifting insecticidal materials. As we have stated before, we believe that the answer to this problem, admittedly a very serious one, will be found, not in new laws and rules, but rather in intelligent cooperation among all the parties in the affected areas.

Guest Editorial written especially for this issue of Agricultural Chemicals.

Chemical Treatment of Florida Soil Increases Yield Threefold

By

L. O. Gratz

Assistant Director-Research
Florida Agricultural Experiment Stations

AGRICULTURAL conditions in the Florida Everglades were bad in 1924. Although there appeared to be abundant feed for grazing cattle, nearly 60 percent of the cows on the south and southeast shores of lake Okechobee were sterile and malnutrition was general. Crops of corn, cotton, rice and others yellowed and died, and fruit, tung and pecan trees either failed to grow, or exhibited severe "frenching" or other abnormal twig and leaf conditions. It was under such circumstances that the Everglades Agricultural Experiment Station was established, and arrangements were made to plant on one acre a variety test of white potatoes. The young plants were sprayed with bordeaux mixture to prevent late blight (*Phytophthora infestans* DBy.), and a good yield was obtained despite the gloomy observation of the farm superintendent who noted that in the Everglades "we always plant everything and never harvest anything."

This marked the beginning of the state's research program in the Everglades, but it was not until 1927 that about a dozen "special" chemical compounds were applied experimentally to over 60 species and types of feed and vegetable crops. Among these special materials were copper, manganese, zinc, single applications of which produced almost normal growth of plants as compared with complete failure where such applications were not made.

As stated, the potatoes of the 1924 - 25 season had been sprayed with bordeaux mixture. This research, gaining momentum, was closely followed by rapid expansion of vegetable growing in the Everglades. In the ten years following 1935 the total vegetable acreage in Palm Beach County alone increased from 47,925 to 77,875 acres. Research had developed a knowledge of the use of minor elements without which such agricultural production would have been impossible in the Everglades. Since then, these elements of necessity

(*Turn to Page 65*)

Effects of some of the newer

Organic Chemicals

On Plant Life

By

Dr. F. P. Cullinan*

Assistant Chief, Bureau of Plant Industry, Soils, and Agricultural Engineering, U.S.D.A.

FOR a number of years studies have been carried on in the Bureau of Plant Industry, Soils, and Agricultural Engineering on the development and testing of new chemicals for use in spraying for the control of plant diseases. In cooperation with the Bureau of Entomology and Plant Quarantine, chemicals prepared for insecticide tests by that Bureau, and having the required physical properties for use as sprays, have been tested in our fungicide laboratories to determine their possible value for use as fungicides. Chemicals developed at the Eastern Regional Laboratory of the Department at Philadelphia as well as those of some commercial agencies, also have been tested.

The procedure usually followed for testing these materials is as follows: suspensions or solutions of the chemical are made up at the dosage ordinarily applied to orchard or field crops and sprayed on glass surfaces. The residues are then seeded with spores of pathogenic fungi and observations are made as to the toxicity of the chemicals to these spores. The same suspensions are sprayed on sensitive plants such as beans in the greenhouse or on peach or apple foliage in the orchard to determine whether they are injurious to plants. If any of the samples show promise, both from the standpoints of spore killing and plant tolerance, they are further tested in combination with insecticides to see whether any fungicidal change has occurred and whether foliage injury may result. If all of these tests are satisfactory, enlarged orchard and field tests involving control of specific diseases are inaugurated.

When DDT had been demonstrated to be so highly effective as an insecticide, certain questions were immediately raised as with all new insecticides—*what effect will it have on the plants, both when applied to the foliage, flowers, and fruits and where incorporated in the soil?* Such questions could be answered only after carefully controlled experiments had been made. It had been known that this chemical was relatively insoluble. No information was available on the cumulative effects that might be reproduced when applied to plants or soils.

The research work planned to answer some of the questions on toxicity of DDT and other chlorinated hydrocarbons has been carried on at the Plant Industry Station, Beltsville, Maryland. The results reported here were obtained by A. C. Foster, Senior Pathologist in the Division of Fruit and Vegetable Crops and Diseases. The experimental work has been divided into two distinct lines of investigation: (1) the application of DDT to plant foliage as for insect control, and (2) the application of DDT and other chlorinated hydrocarbons to different soils at different concentrations. The work conducted thus far has been on beds in the greenhouse and in cold frames out of doors that are exposed to natural weather. Under field conditions DDT has been sprayed on plants at concentrations recommended for the control of insects attacking the plants under study and in larger quantities to determine the injurious effect of increased concentrations. Data on only two seasons have been obtained under field conditions and on only three winter seasons in the greenhouse. Some of the experiments of necessity have been of an exploratory nature and the results obtained from them are not to be considered as final and conclusive, nor should they be interpreted as setting a definite pattern for the use of these insecticides.

In addition to DDT, other chlorinated hydrocarbons have been included in the test. These are 1, 2, 3, 4, 5, 6 hexachlorocyclohexane, or as referred to hereafter, benzene hexachloride; chlordane and "Toxaphene." The almost phenomenal efficacy of these insecticides has been widely discussed in the press. The fact that these materials might be injurious to plant life, however, especially as an accumulated soil residue after a period of several years, has received very little attention.

DDT on Foliage in Field

DURING the summer of 1945 the application of 10 percent DDT pyrophyllite dust with or with-

*Presented at A.I.F.A. Spring Meeting, Rye, N. Y., April 25, 1947.

out sulfur caused severe injury to yellow crookneck squash. The initial application killed many of the plants application. The degree of injury outright within 10 to 12 hours after varied widely from severe injury and death of plants to minor yellowing of leaves and partial or complete recovery. The younger plants were more susceptible to injury while older plants tolerated this strength of DDT. There was no apparent injury to other crops tested such as peas, cabbage, onions, turnips, potatoes, beans, tomatoes, cucumbers, cantaloupes, and sweet corn.

In the season of 1946, field experiments were repeated with these vegetables. Again yellow crookneck squash was severely injured by an application of six-tenths of a pound of technical DDT applied as a 50 percent wettable dust to 100 gallons of water. The application of this spray to potatoes and beans caused symptomatic effects on the foliage. Again no injury appeared on peas, cabbage, turnips, tomatoes, or beets.

The effect of benzene hexachloride, chlordane, and "Toxaphene" — all chlorinated hydrocarbons—was tested under greenhouse conditions on four soils in greenhouse benches. The soils were Chester clay loam, Sassafras sandy loam, Evesboro fine sand and muck. The DDT was mixed with the soil at various rates. A number of vegetable crops including most of those on which observations had already been made under field conditions were then seeded in the soil. On the lighter soils 25 pounds per acre of technical DDT depressed or retarded the growth of some vegetables such as cantaloupes, cucumbers, yellow crookneck squash, beets, spinach, tomatoes, and snap and lima beans. With larger quantities of DDT per acre, the growth of these crops was depressed still more. On muck soils 25 pounds of DDT per acre had only slight effect on the growth of these crops if planted immediately and no effect if planted two months after mixing the DDT in the soil. The application of 25 pounds of technical DDT per acre to the lighter soils had no effect on corn, turnips, cabbage, broccoli and radish. It was apparent from these experiments that there was a difference in the response of individual crops to these differential soil treatments.

It was interesting to note that in the case of muck soils the addition of lime to the DDT treated soil resulted in depressed growth of some of the vegetable crops. Three months after incorporating the DDT in the acid muck soils there was no toxicity to the plants from levels of DDT as high as 1,000 pounds per acre. On the muck soils to which lime had been added and mixed with the soil, the DDT toxicity has remained constant to plants grown in this soil.

There is some indication that decomposed products of DDT are also injurious to plants. When "sulphone," which is known to be one of the by-products of technical DDT, was added as a trace, injury was much more severe. Similarly, a more highly purified form of the para para prime DDT was less toxic than some of the technical DDT formulations previously used. Just what the effect of the organic matter in the soil had on retarding toxicity, or the presence of lime which changed the pH of the soil had on the increased toxicity, is not known. Gamma hexachlorocyclohexane, which has proved to be a very effective insecticide, has also proved to be highly toxic to all plants tested even at fairly low levels in the soil. All four of the chlorinated hydrocarbons made depressed plant growth when applied to the soil at relatively low levels without causing any obvious symptoms. The depressed growth has been measured by recording the effects on the time of emergence and early development of the plant.

At the present time substantial data are not available to indicate the permanence and stability of these chlorinated hydrocarbon insecticides under all soil and climatic conditions. Soil type and character, especially the quantity of organic material or colloidal clay present are important factors in determining the toxicity of these products. The data obtained as a result of soil residue experiments continued over a two-year period indicate that these materials should be used with caution, and concentrations should be held at the minimum, at least until we have a more perfect understanding of their permanent effects. If after continuous applications of DDT or other chlorinated hydrocarbons to plant foliage for insect control, a residue may inhibit plant growth, the injurious effects may become permanent and difficult to remove.

It appears to be well established that all of these insecticides are stable, are resistant to soil microorganisms and that they are insoluble in water and do not leach appreciably. Experiments conducted under greenhouse conditions, however, do not necessarily give results that would apply to field conditions. Such results are only a very good indication of what one might expect to get under field conditions. Additional studies are needed to determine what effect the continued use of these materials in orchard sprays may have on orchard soils. We are aware of the condition that has developed in the Pacific Northwest from the continued applications of arsenate of lead as an insecticide. Arsenic poisoning of the soil has resulted and presents a problem of removal where these soils are to be made fit for the replanting of orchards or for the use of field crops.

No phytotoxic effect has been observed by pathologists when DDT has been used on apples, pears, plums, quince, nectarines, and citrus. That is, where the material has been applied to fruit and foliage at concentrations necessary to obtain satisfactory insect control. Similarly, no phytotoxic effect has been observed where benzene hexachloride has been used on apples, peaches and plums.

It has not been used extensively enough to reach any conclusions as to its effect on other fruits. Other new organic insecticides have not been used extensively enough to reach any conclusions as to their phytotoxic effects.

The most important findings from these studies may be summarized as follows:

(1) Crops vary in their response to DDT when used as a spray on the foliage or when mixed with the soil in which they are grown. In general, young plants are more susceptible to injury than old plants.

(2) A soil residue of as little as 25 pounds per acre has been demonstrated to be toxic to certain plants on some soils when used under greenhouse conditions.

(3) The impurities found in DDT appear to contribute to the toxicity of this product. Results obtained to date suggest that pure para para prime DDT has a lower phytotoxicity than does the technical material.

(4) Soil type and character, especially the amount of organic material, or colloidal clay present are highly important in determining the toxicity of these products.

(5) The application of lime to some soils appears to have a marked effect on increasing toxicity.

Toxicity of 2, 4-D

2, 4-dichlorophenoxyacetic acid is toxic to many kinds of broad-leaved crop and garden plants when applied to soil. Even two or three pounds per acre may check the growth of some kinds of crop plants. Toxic effects of 2,4-D in soil are, however, only temporary provided certain environmental conditions prevail. Factors that effect the inactivation of 2, 4-D in the soil are (a) soil moisture, (b) soil temperature, and (c) the quantity of organic matter in the soil. Toxic effects of 2, 4-D in air-dry soil may persist for several years. When the soil is moistened, however, the toxic effects very often disappear within a period of from 2 to 6 weeks. Likewise, toxic effects of 2, 4-D persist in soil kept at a low temperature (around freezing) but the rate of inactivation increases with increasing temperatures and a maximum rate prevails when the soil is held at about 70-75°F. Toxic effects of 2, 4-D also persist in soils which are very low in organic matter.

Summarizing our data on soil effects of 2, 4-D, its inactivation in soil seems to be due in part at least to the growth of soil microorganisms and factors which favor their growth also favor the inactivation of the chemical. In addition to the inactivation of 2, 4-D by soil microorganisms, some of the chemical is no doubt adsorbed by soil colloids so that its toxic effects are reduced.

2, 4-D is apparently not toxic to sheep and cows when used in amounts ordinarily recommended for weed control. These conclusions are based on results of feeding tests carried on by our Bureau in cooperation with the Bureaus of Animal and Dairy Industry in which cows and sheep were pastured on foliage sprayed with twice the quantity of 2, 4-D ordinarily recommended for weed control. Furthermore, a cow was fed 5½ grams of 2, 4-D daily for a period of 106 days without measurable effects on her food consumption, milk production, or general well-being. While this animal was consuming 2, 4-D, a concentration of approximately 11 p.p.m. of the chemical was detected in her blood stream, but no 2, 4-D could be detected in her milk, nor in the muscle or liver tissues following autopsy.

Regarding the effect of 2, 4-D on humans, 500 milligrams of pure acid has been consumed daily over a period of 21 days by an adult male without ill effects. No skin irritation or other ill effects have been reported by workers who have handled 2, 4-D over a period of several years.

It should be pointed out, however, that commercial preparations contain various forms of 2, 4-D and other ingredients. These have been tested to a limited extent with respect to animal toxicity. So far none has proven to be significantly more toxic than 2, 4-D.

Persons using 2, 4-D for weed control have very often experienced difficulty in cleaning the residue from sprayers. The following method has been developed by our workers in the field of Plant Hormones at Beltsville and should prove useful in overcoming this difficulty:

The spray tank is first rinsed with water and then filled almost to capacity with hot water (under boiling or about 180° F.) and household ammonia is added at the rate of about 2 teaspoonfulls per quart of water. The filling with water is then completed, the ammonia solution stirred and the sprayer closed. A small portion of the solution is then sprayed through the nozzle and the remainder allowed to remain in the sprayer for about 18 hours or overnight. The equipment is then drained and rinsed twice, a portion of each spray being sprayed through the nozzle.

Soil Disinfestation Materials

IN recent years new chemicals have been developed for use in controlling nematodes in the soil. Among the more promising now under test by our Division of Nematology for control of the rootknot and other nematodes are (1) mixtures of dichloropropene-dichloropropane, commonly referred to as "D-D," (2) monobromomethane, usually referred to as methyl bromide, and (3) 1, 2 dibromoethane, commonly called ethylene bromide or ethylene dibromide. These materials are applied to the soil with specially designed applicators. These chemicals are quite volatile and when used as nematocides do not leave a permanent residual toxic effect on soils. All of these organic nematocides, however, are toxic to living plants. Treatment of the soil must be made prior to the planting of seeds or transplanting of crops. Certain precautions must be observed, however, in handling these chemicals since they are either contact poisons or affect the respiratory system if fumes or vapors from them are inhaled.

Work is being continued in our Bureau on basic research to determine the causes of toxicity resulting from the application of organic insecticides and fungicides to plants and soils. These studies will be carried on by specialists in our Divisions of Fruit, Vegetable, and Specialty Crops; Soils, Fertilizers, and Irrigation; and Nematology. ★ ★

Progress Report of New State Legislation

Editor's Note: The following summary of bills considered by the several state legislatures was presented by W. W. Sunderland, chairman of the Legislative Committee of the A. I. F. Association at the recent meeting at Rye, N. Y. He stated that a total of 134 bills were examined during the legislative season from January 1st, 1947 through April 1st, 1947. A number of legislatures were still in session, and it was expected that a considerable number of new measures might be introduced subsequently. The following measures are grouped according to the general type of legislation:

Economic Poison Bills

Enacted

Arkansas House Bill #193. While this law is not patterned after the Model State Bill, it does not conflict. Practically all national manufacturers are exempt from its registration provisions.

Kansas House Bill #70. While this law is patterned for the most part after the Model State Bill, opposition to some provisions resulted in reduction of fees from $25 to $15 per brand. A hearing was provided before registration could be refused or canceled, and labeling Option 2 was reinserted.

Montana Senate Bill #61. This is an identical model law, and does not require fees for registration.

New York Assembly Bill #2175 (S-2103). This law is identical with the Model State Bill except that the registration section was eliminated. (No fees).

North Dakota Senate Bill #211. As introduced, this bill had some objectionable features, even though patterned closely after the Model State Bill. Amendments were provided for labeling Option 2, and also to provide for a hearing before an impartial body before registration can be refused or canceled. (Fees $5 per brand for five brands, $1 per brand thereafter).

South Dakota Senate Bill #98. As introduced this bill was objectionable. The bill was amended to provide for labeling Option 2, and also to provide for "registration under protest." As passed, the law is entirely satisfactory. (Fees are $5 per brand for five brands, $1 per brand thereafter).

Vermont House Bill #209. This was the Model Bill without the provision for "registration under protest." The bill was amended to include this provision. Fees are $5 per brand, with a maximum fee of $50 per registrant.

North Carolina House Bill 748 (S-286). This bill, while generally following the pattern of the Model Bill, was opposed by the industry. As passed, the law provides for only one ingredient option. A fee of $10 per brand without any maximum, is also provided for. Several new features were added to the law—"stop sale orders," "penalty refund for short weight," etc. This bill became law over the objections. (Actually, agricultural producers were subject to same labeling requirements and same fees under the existing law).

Oregon Senate Bill #8. This was an amendment to the existing law.

Failed to Pass

West Virginia Senate Bill #258 (H341). This bill, patterned after the Model Bill, passed the House but failed to pass the Senate at the time of adjournment. Some opposition to passage was offered in the Senate since the bill provided for fees of $10 per brand without any maximum.

Utah House Bill #162. This bill was patterned after the Model State Bill, but died due to the adjournment of the legislature. Some opposition to passage in the Senate had been offered, since the bill provided for fees of $10 per brand without any maximum.

Indiana Senate Bill #180. This bill, patterned after the Model State Bill, died in the Senate Committee due to the adjournment of the legislature. This bill would have helped correct a bad pharmacy situation in this state. However, as introduced, the bill provided for enforcement by the State Board of Health. It was suggested, however, that the administrative agency be designated as the Department of Agriculture.

North Dakota Senate Bill #27. This was an extremely objectionable economic poison bill. At the request of the A.I.F. Association, this bill was withdrawn from the Committee and the Model Bill (S-211) was introduced and became law.

New Mexico Senate Bill #241. This was a favorable Model Bill, but it failed to pass due to adjournment of legislature.

Still Active

Rhode Island House Bill #945. The A.I.F. Association was consulted before introduction of this bill, and a completely satisfactory Model Bill was introduced. Fees are $5 per brand, with a maximum fee of $50 per registrant.

Rhode Island House Bill #256. This bill is identical with the Model State Bill. However, as introduced and referred to the Committee on Agriculture, it did not designate the amount of the fees, nor the penalties. To date it has not been reported out of Committee. The Committee has been requested to insert fees of $5 per brand, and a maximum fee of $50 per registrant.

Colorado Senate Bill #282 (H-754). This bill as introduced, contained some confusing wording and conflicting provisions. It has been satisfactorily amended and is now a good Model Bill. As amended, it passed the Senate. Fees are $5 per brand, with a maximum fee of $50 per registrant.

Iowa House Bill #160. As introduced, this bill was objectionable since it provided only for one ingredient option and since the registration section had been substituted with a registration section taken from the present Minnesota law. Support of the administrative officials was secured to have the bill properly amended to conform to the Model State Bill. As amended, this bill has passed the House in satisfactory form.

Massachusetts House Bill #1418. This bill as introduced, was satisfactory in every way, except that the provision for "registration under protest" was omitted. At the request of the association, this provision was reinserted and the bill has been reported from Committee.

Oklahoma House Bill #338. This is a bill which has several objectionable features. There is an attempt to have the Model State Bill substituted, and in the event this is not successful, amendment of the present bill has been requested.

California Senate Bill #742. This bill amends the economic poison law and places the control of advertising in the hands of the administrator of the economic poison law. The bill has passed the Senate and is now in the House.

California Senate Bill #348. This bill consolidates and revises a law regulating sale of poisons. After careful examination, it appears that this bill does not change the status of economic poisons under the California poison law.

Poison Laws

No new poison laws in this session of the legislature were enacted. However, some bills are still active.

Still Active

Colorado Senate Bill #186 (H-652). This bill has passed the Senate, and is now in Committee in the House. It is a typical restrictive pharmacy measure but contains an exemption for poisons used for agricultural or industrial purposes. The standard amendment exempting economic poisons from the restrictive provisions of the bill has been offered.

Minnesota Senate Bill 734 (H-875). This bill amends the Minnesota economic poison law and provides for a public hearing before issuance of regulations affecting the labeling of economic poisons. It is understood that the bill was opposed at the Committee hearing by members of the enforcement division, and action on the bill was indefinitely postponed.

Rhode Island House Bill #816. This bill provides for additional regulations over sale of drugs and poisons. A satisfactory exemption for economic poisons was obtained.

Failed to Pass

Georgia House Bill #455. This bill was directed specifically against poisonous exterminators and insecticides. The provisions were extremely objectionable. The bill was opposed as written and amendments were offered. The bill failed to pass due to adjournment of the legislature.

Pharmacy Bills

Enacted

Georgia House Bill #184. This bill contained provisions which would have restricted the sale of economic poisons. Through cooperation with the Georgia Department of Agriculture, satisfactory exemptions for economic poisons were obtained.

Georgia House Bill #185. This bill as originally drafted, contained provisions which would have restricted the sale of economic poisons. The Georgia Department of Agriculture later agreed to satisfactory exemptions for economic poisons.

Idaho House Bill #145. This bill contained provisions which would have worked a hardship on the distribution of economic poisons. Proper amendment exempting economic poisons from the provisions of the bill, was successfully secured.

Failed to Pass

Delaware Senate Bill #76. This bill would have restricted the sale of economic poisons and livestock remedies to drug stores. The State Department of Agriculture subsequently agreed to a satisfactory amendment and the bill was reported favorably as amended. It failed to pass due to adjournment of the legislature.

Delaware Senate Bill #80. This bill would have restricted the sale of economic poisons and livestock remedies to drug stores. The bill was satisfactorily amended and was reported favorably as amended. It failed to pass due to adjournment of the legislature.

Wyoming House Bill #60. This was reported as a uniform pharmacy act and was restrictive in nature. The satisfactory exemption was inserted in this bill through the assistance of the Proprietary Association. The bill failed to pass the Senate due to adjournment of the legislature.

Georgia House Bill #186. This was an extremely objectionable pharmacy bill and absolutely would have prevented the sale of economic poisons except through drug stores. Faced with opposition by the Department of Agriculture, the bill was killed in Committee.

Indiana Senate Bill #179. This was an objectionable restrictive bill, limiting the sale of poisons to drug stores. It was killed in the Senate.

Indiana Senate Bill #314. This bill required a signature in the poison register or a signed order before sale of an economic poison could be made. The bill failed to pass the House at the time of adjournment.

Still Active

Rhode Island House Bill #992. This bill rewrites the entire health code for the state of Rhode Island. A proper exemption was contained in the pharmacy section of this bill, removing economic poison materials from the restrictive sales provisions. Another section provides for coloring, and regulates the use of fluorine compounds in food establishments. This same section was contained in an identical bill introduced in the 1946 legislature. This section was called to the attention of the manufacturers of fluorine compounds for agricultural use, and no objection was offered to the wording of the bill.

Bills to Restrict Spraying of Poison

Failed to Pass

Utah House Bill #184. This bill controls the use of arsenic and other poisons on crops for the protection of livestock. As drafted, the bill was too broad and it was opposed on these grounds. The bill died due to adjournment of the legislature.

Still Active

California Assembly Bill #944. This bill as originally drafted, seemed entirely too broad, and its passage was protested. The bill has been reported by substitute, and while it imposes serious restrictions on the application of poisonous materials, it limits itself to control of agricultural pest control operators. It does not affect the application of these materials by the owner of a farm, if he makes the application himself.

New Hampshire House Bill #184. This bill prevents the application of poisons to plants in bloom, except such materials as may be designated as fruit thinning sprays by the Commissioner of Agriculture.

Idaho Senate Bill #148. This bill sets up restrictions on the use of airplanes in applying poisonous insecticides.

State Spray Service Bills

Enacted

Oklahoma Senate Bill #56 (H-75). This bill authorized the State Department of Agriculture to provide a spraying service, to purchase materials, and to charge for such service. While some limits were placed on the operations conducted under the provisions of the bill, the bill became law in spite of objections of various groups.

Still Active

Oklahoma Senate Bill #89. This bill authorized the Department of Agriculture to set up a spraying service for protecting pecan trees.

Oklahoma Senate Bill #108. This bill sets up appropriations for the destruction of rats and predatory animals.

Oklahoma Senate Bill #130. This bill provides for a spraying service to eradicate bindweed.

Pest Control Operator Bills

Enacted

Tennessee Senate Bill #170 (H-284). This bill was primarily designed to regulate pest control operators, and contained an exemption which excluded the sale of insecticides when such materials were not sold in connection with services. It is doubtful whether any difficulty will be encountered under this law, since it was definitely the intent not to include sales of economic poisons when such sales were not connected with service.

Miscellaneous Bills

Failed to Pass

Utah House Bill #170—Livestock Remedies. This bill died in House due to adjournment of legislature.

California Senate Bill #743 — Sodium Fluroacetate. This bill was properly amended to permit use by properly licensed pest-control operators. It is still in Committee.

Massachusetts House Bill #79—Vermin —Poisons. This bill was amended satisfactorily. It has been reported favorably in the House, and no further action has been reported.

Bills to Restrict Spraying of Poisons

California SB's 438, 487; Connecticut HB-271; Idaho SB-148, HB-199; Maryland HB-524; Minnesota SB-1153 (HB-1309); Wisconsin SB-458; Vermont HB-45.

Appl
Eq

Associate Agricultural Engineer
U.S.D.A., Toledo, Ohio

LACK of suitable application equipment for research studies is one of the greatest handicaps for investigators using insecticides and fungicides. Cut and try methods in equipment development and test have necessarily been used to a considerable extent in the past. Generally, the performance characteristics of the application equipment in relation to the particular pest control requirements, is not known or determined. It is, therefore, essential that fundamental engineering studies be made, parallel with investigations of entomologists and plant pathologists.

Until recently it has been assumed generally that the engineer could fulfill his obligation by furnishing equipment according to the request of the other scientific workers. But obviously this is not enough. The engineer should be included in surveying the problem and share responsibility in helping to establish the equipment requirements. He should obtain basic information necessary for new developments or improvement of equipment and application methods. This cooperative effort will in the long run speed up work and give the grower more effective and efficient machines.

Agricultural engineers of the U. S. Department of Agriculture, Toledo, Ohio, have been working on pest control equipment problems in close cooperation with entomologists and pathologists who help to guide the engineering work. Investigations of the engineers have been to determine fundamental equipment requirements and where necessary to conduct development studies, correcting deficiencies and improving equipment. To meet equipment needs for experimental use, it has been necessary to build or adapt machines which permit a wider range of adjustment and more positive control of machine performance than is necessary on commercial equipment.

Whenever possible the preliminary equipment test and development work is carried on under controlled conditions in the machinery laboratory. Special tests apparatus is devised for making accurate determinations of mechanical performance.

Entomologists and plant pathologists advise that the general requirements for effective treatment which must be considered in a study of application equipment are: (1) Use of effective materials properly formulated for the particular method or equipment, (2) effective dosage applied at a uniform rate, (3) proper placement of material on the plant, (4) proper timing of applications, and (5) adequate number of applications.

Dosage control, uniformity of application, and proper placement or coverage are functional requirements of the equipment. If equipment fails to meet these requirements, the only alternative is to use higher application rates in order to make up for deficiencies in the equipment. However, this practice has its limitations; materials are wasted by overdosage and in some formulations the toxicity of certain ingredients may exceed the plant tolerance and cause injury to the crop. In some cases objectionable residues are increased. Minimum effective dosage, which has always been an important consideration, is more difficult to attain with concentrated applications.

Hydraulic spray treatment with ground machines, using dilute water suspensions, has been one of the common methods used. It is generally used as a standard of comparison, as there is less variation in mechanical performance than with other methods. This equipment is rather well standardized as to effectiveness of performance. The problem is largely a matter of adaptation to the particular job.

Hydraulic equipment and spray materials are heavy, power and labor requirements are high, and an abundant water supply is required. However, the hydraulic spray method possesses certain advantages among which are its ability to be operated throughout the day without regard to light winds; its dosage and application rates are easily controlled; satisfactory placement of spray material can usually be obtained, and adhesion of spray material is relatively high.

*Address before spring meeting of the Agricultural Insecticide and Fungicide Assn., Rye, N. Y., April 24, 1947.

Spray Pattern Important

PRIMARY consideration should be given to the spray pattern to meet the job requirements. These requirements may vary widely, depending upon the pest and the crop to be treated, as well as the growth stage of the crops. For example, in development tests at Toledo with dilute suspension sprays for corn borer control, it was found that a solid cone type spray pattern consistently gave much higher borer reduction than applications with conventional hollow cone nozzles when using the same dosage and application rates. The gallonage per acre could be materially reduced with the solid cone nozzles while still obtaining borer control equal to that given using conventional nozzles at high gallonage treatment.

Rather extensive studies of crop dusters have been made at the Toledo laboratory, as there appeared to be considerable need for improvement in this type of equipment. Work of the station was necessarily limited, so it was considered advisable to concentrate efforts on a problem in much need of study.

Irregular performance of dusters has been observed in the field for many years. The feed rate on most commercial dusters was erratic and distribution of dust to nozzles was uneven. The air delivery of some machines was inadequate to disperse the dust properly.

Laboratory facilities and techniques have been developed to permit close measurement of duster performance. Very little progress could have been made in research investigations in duster equipment without this special apparatus and test techniques. For test purposes a multiple dust collector was developed which collects separately all of the dust discharged from the individual nozzles without affecting the flow of air through the duster. The apparatus consists of a chamber 14 ft. long, 8 ft. wide by 6½ ft. high, to which an exhaust fan is connected. Dust collector bags are suspended horizontally across the chamber with the open ends extending through openings in the front panel. The bags are quickly detachable, to make weight determinations and take dust samples for physical or chemical analysis. One bag is used for each nozzle of the duster being tested. The duster to be tested is set up in front of the collector with each nozzle set to direct the dust laden air blast through the bag opening. The fan maintains a partial vacuum within the chamber, causing the dust blast to be drawn into the bags where the dust is trapped, while the air passes through and is exhausted from the chamber.

Multiple outlet field crop dusters of all sizes can be tested with this apparatus under controlled conditions to determine feed rate performance, distribution and fractionation of dust. Special apparatus and instruments are used in making air volume and velocity determinations. These laboratory facilities have been made available to manufacturers of dusters and dust materials. Many of the standard commercial dusters have been tested. The results were very revealing and substantiated statements of other research workers that erratic mechanical performance frequently causes greater differences in pest control than differences in effectiveness of various dust materials or dosages used.

Control of Feed Rate

UNRELIABLE feed rate control was considered to be the most serious fault in commercial dusters. Under controlled laboratory tests much difficulty was experienced with most makes of dusters in attempting to arrive at and maintain a desired feed rate. While variations in dust distribution were measured in many duster models. Fractionation or mechanical separation of dust materials which occurs within the duster has been closely associated with the problem of dust distribution. The primary cause of fractionation is the difference in physical characteristics of dust materials. Objectionable separation has not been found when dust distribution was reasonably uniform.

The numerous kinds of dust materials used are of widely varying physical characteristics, making it necessary to correlate machine tests closely with a study of dust materials. Dusters with the feed opening at the bottom of the hopper are affected by changing dust level. Any change in the condition of a given dust at the time it is placed in the hopper also affects the feed rate of this type of machine. A dust that is well packed from standing in storage or for other reasons will feed much more slowly than the same kind of dust that is relatively fluffy from recent mixing. The variations in densities of different kinds of dusts naturally affect the feed rate due to differences in weight volume relationship. However, there is no significant correlation of feed rate of different kinds of dusts on a weight volume basis. Reduction of particle size of a dust material, due to processing methods, causes it to feed more slowly and to become more difficult to handle in most dusters. Much progress has been made by some duster manufacturers in reducing feed rate and distribution difficulties.

With the laboratory facilities and test techniques available, it was possible to proceed with positive development studies. Since the lack of an accurate dust feed mechanism was the major obstacle to all tests with dusters and dust materials, both in the laboratory and field, it was given primary consideration. As a result, a new type of dust feeder was developed by the U.S.D.A. engineers, capable of extreme accuracy in dust control. The operation principle is simple, employing only one moving unit in the hopper. This moving unit, a vertical impeller, elevates and rapidly circulates the dust from bottom to top of hopper through a central tube. This rapid circulation and overflow at the top quickly brings the dust to its highest point of fluffiness and maintains it in that condition while it is being fed. A positively adjusted dust feed part is located near the top of the central tube. The deviation in feed rate with any given dust is less than 2 percent. A number of commercial machines tested showed deviations from 50 to 300 percent.

This new feed mechanism was embodied in a complete duster unit designed for control of air volume delivery from 62 to 220 c.f.m. per

nozzle. Peak air velocities measured 12 inches from the nozzle ranged from 800 to 2400 ft. per minute. Air volumes and velocities of most commercial dusters fall in the lower end of the above ranges. Two of the special dusters have been made, mounted on special self-propelled chassis and used in field experiments. With this equipment it is possible to conduct experiments with a high degree of accuracy not possible before. In field tests the effectiveness of insect control increased significantly as the air volume and velocity increased.

Air Volume Aids Adhesion

IN adhesion tests on potato foliage, using a copper fungicide dust, the initial deposit and final adhesion after 10 days weathering was increased as the air volume and velocities were increased. In one series of tests, using four air volumes from 120 to 220 c. f. m. per nozzle, the average copper deposit, after weathering 10 days, was 61.5 percent greater for the 220 c.f.m. compared with the 120 c.f.m. Field tests with dust materials processed to reduced particle size showed no significant improvement in adhesion to plant foliage. These tests, which have been repeated, indicate rather definitely that high air volumes are to be desired.

High velocity dusters, however, are subject to abrasion and rapid wear from some dust materials. Dust abrasion studies were carried on to determine the relative abrasiveness of different materials in relation to duster machine wear. In order to conduct the abrasion tests, it was necessary to develop test equipment and techniques which would reduce the variables and give measurable results in a short time. A simple, reliable method was developed to give results in a 10-minute test period. Tests could be duplicated with variations of less than 2 percent. Considerable difference was measured in the abrasiveness of different materials. The natural hardness of the material, as is to be expected, is the main influencing factor. Reduction in particle size of a given abrasive dust has a quite marked effect in reducing its abrasiveness.

Dust drifting with ground machines is considered unsatisfactory because dust deposits are irregular, placement and coverage are generally inadequate and the dust mixtures are subject to sorting or separation. Results of tests in a 50-ft. fractionation or drift tunnel in the Toledo laboratory showed conclusively that the materials are sorted according to particle size regardless of the thoroughness or method of mixing. This usually causes a wide variation in deposit of active ingredients.

Any drift or broadcast type application, whether dust or vaporized liquid concentrate, is at the mercy of the wind or thermal currents when the energy of discharge is dissipated.

The new types of liquid concentrate applicators relying on drift or utilizing an air blast for lateral wide swath coverage are spectacular and attractive from the standpoint of speed of treatment. Uniformity of application and adequate deposit over the swath are difficult to attain, however, with this type of machine. Most of these machines should be considered as still in the experimental stage.

Interest is high at this time in the use of aircraft for distribution of insecticide and fungicide dusts. The number of planes being equipped for dusting has increased greatly since the war. Most of the dusting work is done by custom operators who have built and installed their own dispensing units. No standard or universal designs are generally used and wide variations in equipment exist, although the operating principle is similar.

Aerial spraying of liquid concentrates is a relatively recent development which is still in the experimental stages. The airplane spray applicators developed by the military forces during the war are unsuitable for general crop treatment.

Dust Control Difficult

IT is difficult to control distribution of dusts and sprays from the air. Applications should be made when there is little or no air movement, either wind or thermal currents.

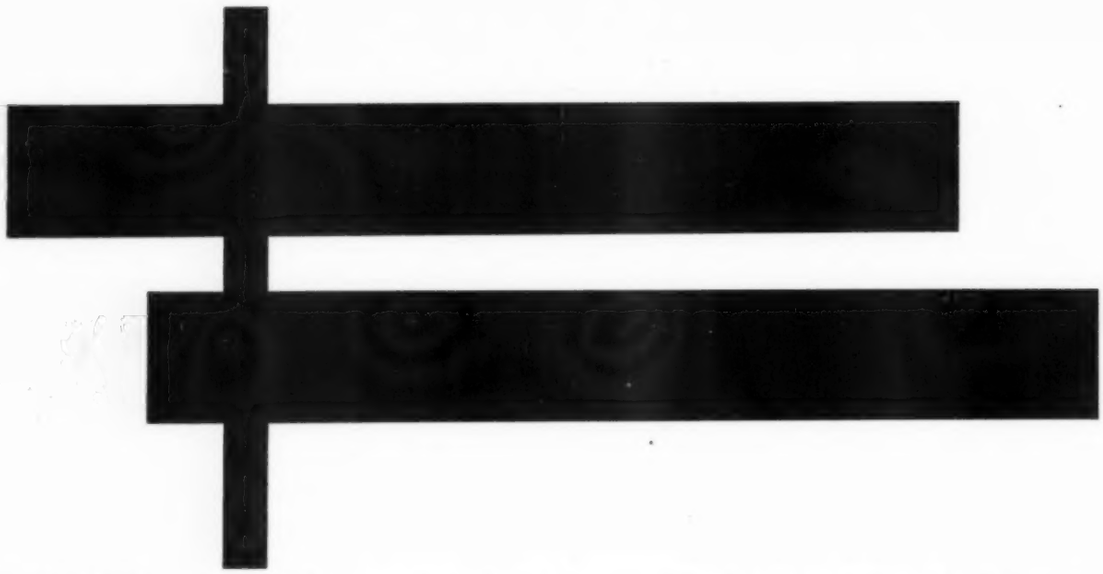
During 1945 and 1946, aerial applications were made at Toledo with both sprays and dusts for corn borer control. Special experimental equipment was developed for use on a Piper Cub. Spray equipment was also developed for use on N3N and Stearman planes for experiments in forest insect control.

The dust unit was similar in principle to conventional design, except that extra agitation was provided in the hopper to prevent bridging and insure continuous flow of dust through the feed opening. A relatively large venturi was used which gave good dust dispersion so that no objectionable agglomeration of dust particles was noticed at any time. The dust pattern of this equipment, as is common with most airplane dusters, was concentrated in the center of the swath and tapered off sharply on the sides. The effective swath width was approximately 30 feet. Subsequent equipment performance tests using dust recovery technique showed that 5 to 8 times as much dust was deposited in the center or flight line as was deposited 10 feet on either side. At 20 feet either side of the flight line this ratio was as high as 23 to 1.

It is known that other types of planes and dusting equipment will give different performance. However, the same faults were common to all aerial dusters which have been tested or observed by the Toledo engineering staff. The dust feed rate is erratic and is very difficult to control within satisfactory limits. Dust deposit over the swath varies greatly, with a heavy deposit in the center line of flight.

The concentrate spray apparatus used for airplane spray tests consisted of nozzle booms under the wings with a pump pressure system. This permitted changing the nozzle arrangements in an effort to level down the spray deposit over the swath. The boom span was 25 feet. No nozzles were required under the fuselage as the air turbulence of the slip stream caused the pattern of spray from the sides to join in the center. The vortex of the wing tips caused the spray to be carried laterally and widened the swath considerably beyond the outer limits of the boom. An effective swath of approxi-

(*Turn to page 69*)



TOXICITY and insecticide residue problems, legislation, labeling, and matters technical and economic were discussed by representatives of government and industry at the spring meeting of the Agricultural Insecticide and Fungicide Association at the Westchester Country Club, Rye, N. Y., April 23-25. The meeting attracted the largest registration of any spring convention in the history of the association.

Executive secretary Lea S. Hitchner, in his report, reviewed the history of the industry, pointing out how the Insecticide Act of 1910 was brought about through cooperation between industry and Government, and how the industry has developed in recent years. New developments in the economic poisons field have brought about complications, he said, which make necessary an education program in the industry. "There is a distinct need for some type of educational program for industry personnel," he stated. "Industry has a historical background of custom, economic influences and other factors which affect its operation. But not all industry members have this fundamental background, particularly with the many new employees coming into an expanding industry and with many new companies entering the field. It must be recognized that new blood and changing conditions modify and change old practices.

"There is a great need for the dissemination of fundamental information on insecticide and fungicide regulatory laws. . . . many of the regulatory agencies take the position that much of industry does not have the proper 'know-how' to compound and label for use insecticides and fungicides," he reminded the group. He then related the part the association has taken in supporting the model state insecticide law drafted by the Council of State Governments, and the proposed new Federal insecticide and fungicide act designed to reduce confusion created by the existence of conflicting laws in various parts of the nation.

Dr. William J. Hale, research consultant for Dow Chemical Co., Midland, Mich., told the convention that the answer to farm security lies in self-sufficiency; agriculture furnishing industrial raw materials through "chemurgy." In his talk, "Progress or Peonage on the Farm," Mr. Hale indicated that there could be no overproduction in agriculture if farm "surpluses" could find a market as industrial raw materials. He reviewed the national and international aspects of "chemurgy" recommending that nations grow a great portion of their essential raw materials. The insecticide and fungicide industry can play an important role, he noted, in making maximum agricultural production possible.

Walter Mitchell, Jr., vice-president of the Irving Trust Co. of New York, in speaking of "Trade Associations in the Present Economy," reminded the group of the responsibilities of the industry, indicating that the investing public, the laboring public and the consuming public must be considered in the making of policy decisions. Trade Association thinking can and should be on a broader basis than the strictly selfish viewpoint of the individual company, he reminded, because of the diversity of ideas and increased total knowledge of a group. The interest of a group must be in the future, Mr. Mitchell stated, and warned that the trend is strongly toward nationalization of basic industries. He advocated an expanded educational program on the part of industry to inform labor, for instance, of the dangers of upward price spirals, strikes, and the cumulative ill-effect of low production in industry. "The trade association," he stated, "is the best instrument of leadership that industry possesses."

An up-to-date discussion of application equipment for sprays, dusts and other materials* was presented by Frank Irons, associate agricultural engineer of the U. S. Department of Agriculture, Toledo, O. Mr. Irons described in detail some of the newer machines for the application of various toxic materials. He said that five factors entering into the study of application equipment: the use of effective materials, effective dosages applied at a uniform rate, proper place-

*This talk published in full on page 23.

ment of material on the plant, proper timing of applications and adequate number of applications.

Reports Given

COMMITTEE reports were presented by chairmen of the four major committees: Traffic, Technical, Information, and Legislative. E. C. McClintic, chairman of the traffic committee, told the convention that railroad freight rates had increased 22½ percent within the past year, and that with the ending of government subsidies on coastwise shipping, many of the steamship companies are out of business. They state that they cannot operate even on rail rates which are ordinarily higher than those of the waterways. High stevedoring and ship operating rates are given as the prime cause of the difficulty.

Mr. McClintic called attention to a current Interstate Commerce Commission proposal which in substance is a request to the railroads and the Consolidated Freight Classification Committee to put in a uniform basis of freight rates and uniform classifications in the territory east of the Rocky Mountains. Also prescribed by the I. C. C. are "ad interim" rates to be established during the interim until rate levels found reasonable by the Commission become effective. Such ad interim rates are approximately as follows:

Within Official Territory, a 10 percent increase.

Within Southern Territory, approximately 10 percent reduction.

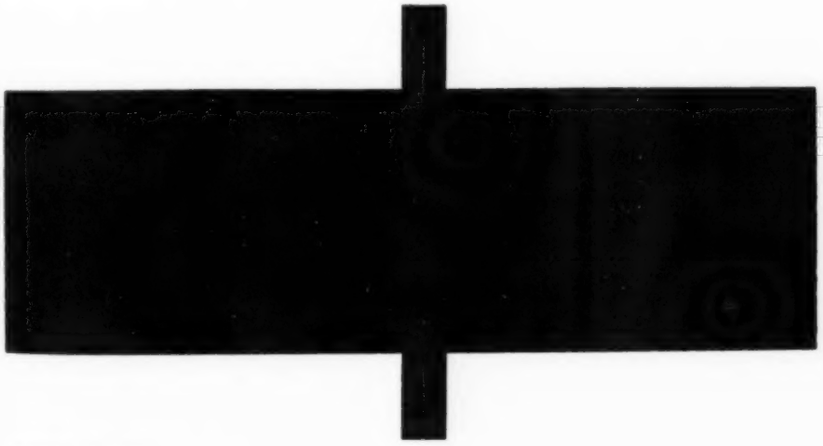
Within W. T. L. Territory, approximately 10 percent reduction.

Inter-territorial between Official Territory and other territories approximately 10 percent reduction.

"This order in the decision with respect to ad interim rates has been contested by the northern states and the western railroads," the chairman reported. The result is that an injunction has been obtained which prohibits the I. C. C. from putting into effect these rate levels. The lower Courts have sustained the I. C. C., but have continued the injunction. The case is now before the Supreme Court, and a decision is expected shortly.

Mr. McClintic advised the industry to analyze present shipments in respect to uniform classification, classification exceptions, and commodity rates, in order to have these data at hand when the Uniform Freight Classification Hearings are held, probably within the year. He warned that higher freight rates are reaching the stage where if the trend continues, it could force the industry to decentralize.

Because of shipping containers which do not meet I. C. C. specifications and also because of rough handling by the railroads, insecticide shipment losses have increased over 300 percent during the past year, according to the Bureau of Explosives and other Dangerous Articles. Mr. McClintic indicated that the Bureau considers this a serious condition, not alone from the monetary loss involved, but also because of the possibility of poisoning other freight in the same car or freight which might be carried later.



The report of the technical committee was presented by Dr. L. Gordon Utter of Phelps-Dodge Refining Corp. He told of the work of the committee in preparing a label manual with the cooperation of the association office and the Insecticide Division of the U. S. D. A. He stated also that a trade name list is in the process of preparation by the association. Other projects of the committee included studies of problems of spray residues, toxicological information on insecticides and fungicides, cooperation with the American Phytopathological Society on a program of uniform field tests with fungicides, uniform testing methods, and problems in connection with poisoning of bees and cattle. Educational activities of the group included arrangements with the Long Island Agricultural and Technical Institute for a course to train students for positions in the laboratories and research departments of the industry.

The report of the legislative committee was presented by its chairman, W. W. Sunderland of Dow Chemical Co. He reviewed the progress being made with the model state bill. "This bill, sponsored by the Council of State Governments, is the result of . . . cooperative work with members of industry and government," he said. "While not entirely perfect, the bill does represent a practical compromise of all opinion. . . . Despite its sponsorship and acceptance by the Association of State Commissioners and Directors of Agriculture, it has been necessary to expend considerable further effort to prevent its passage with undesirable amendments in a number of states. At present, the record shows its passage by nine states, either exactly as drafted by the Council, or with slight and acceptable changes."

The AIF Association has proposed and vigorously supported a standard amendment exempting insecticides and fungicides from the provisions of pharmacy and poisons bills, he indicated. These bills seek to prevent misapplication of economic poisons particularly from the standpoint of unregulated spray or dust drift, of establishing liability in case of poisoning of grazing areas, or accidental

damage to plants or livestock of others, of requiring destruction of emptied containers and similar problems associated with legitimate use of poisonous or hazardous materials. Broadly speaking, the committee feels that this type of law is not a problem for the industry alone, but for the actual consumer as well.

The report warned that the industry is concerned with such laws since they frequently tend to affect the use of toxic products. Examples were cited where as a result of a court's awarding damages in a case of bee poisoning, distributors and users in a western state have agreed not to use arsenical insecticides in any form unless severe infestation brings forth official recommendations of such materials. It was also called to the attention of the convention that a problem has arisen in Georgia where a regulation is in effect allowing a maximum of only 10 percent outage in containers. This margin is not always sufficient for certain fluffy materials, Mr. Sunderland said.

The new Association of Economic Poisons Control Officials recently established on the west coast is expected to prove helpful in gaining uniformity of regulation among the states, the report stated. The speaker expressed hope that all enforcement officials will participate in the work of the association in order to avoid difficulties arising from conflicting requirements.

Mr. Sunderland concluded by emphasizing the necessity of educating company personnel on legislative matters. "Some person should be designated in each company to support or oppose particular bills promptly . . . when such conforms to company policy," he said. "There is still a great amount of work to be done for the cause of uniform and acceptable legislation."

R. B. Stoddard of Dodge & Olcott, Inc., as chairman of the Membership and Information Committee told of the group's activities, stressing the importance of the public relations program carried out by the association. He cited the value of favorable publicity in presenting information on the supply situation, in encouraging wider and wiser use of insecticides and fungicides, and in focusing attention on the need for further basic surveys in the field. He also commended the publicity program as rendering valuable assistance in solving legislative problems of the industry.

Above, first photo, l to r: (back row) Hugh Benjamin, Long Island Fertilizer & Produce Co., Mattituck, N. Y.; A. H. Carter, Sherwin-Williams Co. of Canada; W. S. Gavan, American Cyanamid Company, New York; H. N. Verrault, Velsicol Corp., Chicago. (Kneeling): Robert Wotherspoon, Orbis Products Corp., New York; and F. B. Maughan, Rohm & Haas Co., Philadelphia. Second photo: group including part of technical committee, l to r: Dr.C. L. Smith, AIFA Office; Dr. R. E. Heal, Merck & Co., Rahway, N. J.; Dr. Alfred Weed, John Powell & Co., New York; Dr. L. Gordon Utter, committee chairman, Phelps Dodge Refining Corp., New York; Dr. E. C. Larsen, J. T. Baker Chemical Co., Phillipsburg, N. J.; W. W. Allen, Dow Chemical Co., Midland, Mich.; I. W. Bales, Chipman Chemical Co., Bound Brook, N. J.; Dr. L. G. Gemmell, American Cyanamid Co., New York; and Dr. W. E. Dove, Dodge & Olcott, Inc., New York.

Below, (first photo, l to r): Howard Fisher and B. C. Manker, both of Michigan Fertilizer Company, Lansing, Mich.; Second photo, scene at registration desk: Miss Mary McCormick and Mrs. Lee Manzie, of AIFA office, registration clerks; H. A. Beckman, California Spray Chemical Corp., Richmond, Calif.; C. M. Gibbs, Merck & Co.; Dr. Heal; Russell Dorman, California Spray Chemical Corp.; H. J. Wood, Tobacco By-Products & Chemical Mfg. Co.; Louisville, Ky.; S. A. Rohwer, Bureau of Entomology and Plant Quarantine, U.S.D.A., Washington; John Long of Tobacco By-Products Corp.; and Dr. F. P. Cullinan, Bureau of Plant Industry, Soils & Agricultural Engineering, U.S.D.A., Washington. Third photo: Friar Thompson, R. J. Prentiss & Co., Inc., New York; Paul Mayfield, Hercules Powder Co., Wilmington, Del.; John Long; A. A. Nikitin, Tennessee Corporation, Atlanta, Ga.; S. A. Rohwer; J. G. Brunton, Pennsylvania Salt & Manufacturing Co., Philadelphia, Pa.

Wells Discusses Prices

ORIS V. Wells, chief of the Bureau of Agricultural Economics of the U. S. D. A. presented a thorough study of agricultural prices in his talk on this subject. He went into history, discussing the many factors which have influenced farm prices through the years, and described at length the effect of "New Deal" policies on the over-all picture. Prices of agricultural commodities have an indirect effect on the insecticide and fungicide markets, he pointed out, the value of a crop being a criterion by which the grower decides upon the feasibility of protecting it with chemicals.

Kirk Fox, editor of *Successful*

Farming magazine, in discussing the query, "Should the Scientist Emulate the Sphinx?" described four types of scientists and the feeling of each toward publicity. These, he said, are first the type who welcomes intelligent representatives of a fair publication, and explains complicated matters to the reporter in lay language. The second type of scientist looks forward to the day when he will have time to write a book. He fears that any advance publicity may weaken or destroy publication of his life's work. His research is pretty much a personal matter . . . and he largely forgets that public and private funds support the work he is doing. The third type honestly believes that publicity is beneath his dignity, and will hurt his academic standing and his work. Number four is just too busy to take notice or to meet representatives of the press . . . so burdened is he with his own importance, that little of his work becomes available to fellow scientists.

Mr. Fox went on to say that chemical warfare against pests has emerged from the primary stage into full scale use, and that agriculture itself has definitely moved out of the mechanical into the chemical phase of its history.

Round-Table Discussion

S. A. ROHWER, Assistant Chief, Bureau of Entomology and Plant Quarantine, introduced a panel of Dr. F. P. Cullinan, Assistant Chief of Bureau of Plant Industry, Soils, and Agricultural Engineering, and Dr. A. J. Lehman, Chief, Division of Pharmacology of Food and Drug Administration. (Dr. W. G. Reed, who was to be third member of the panel, was unable to attend.)

Dr. Cullinan told of BPI tests of new materials in which the questions are "what effect will it have on plants; on the edible food parts; can the residue be removed; and what will be the cumulative effect on the soil?"*

Above, (first photo, l to r): D. C. Van Winkle, and Dr. C. C. Compton, Julius Hyman & Co., Denver, Colo.; R. T. Yates, Hercules Powder Co.; Frank Rapp, also of Hercules; D. E. Bonnell, of Julius Hyman & Co.; C. T. Palagonia, Orbis Products Corp., New York.

Second photo: C. M. Gibbs, Merck & Co.; George Hartz, Orbis Products Corporation; J. I. Shafer, B. G. Pratt & Co., Hackensack, N. J.; E. J. Camson, Orbis Products Corp.; W. R. E. Andrews, W. R. E. Andrews Co., Philadelphia, Pa.; and Harold Noble, S. B. Penick & Co., New York.

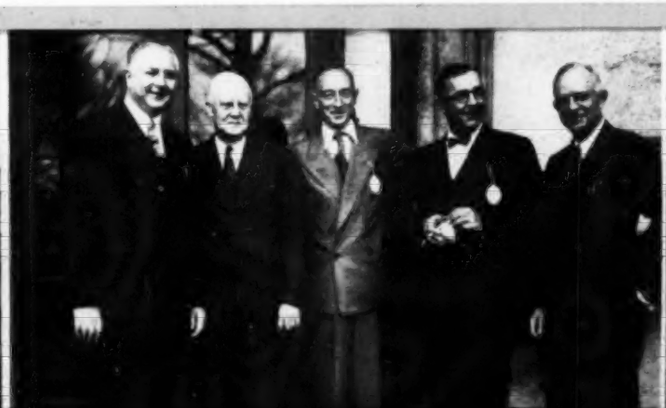
Below, first photo, l to r: J. A. Cavanagh, and W. J. Hale, Dow Chemical Co., Midland, Mich. Second photo: Ernest Hart, Niagara Sprayer & Chemical Division, Food Machinery Corp., Middleport, N. Y.; M. H. Crego, Phelps Dodge Refining Corp.; AIFA president George F. Leonard, Tobacco By-Products and Chemical Corp., Louisville, Ky.; W. J. Liipfert, Woolfolk Chemical Works, Ltd., Fort Valley, Ga.; M. L. Somerville, Sherwin - Williams Co., Bound Brook. Third photo: Mr. Somerville again in his golfing attire, with W. F. Hall, Chipman Chemical Co., Bound Brook, N. J., and George Lamb, attorney, Washington, D. C.

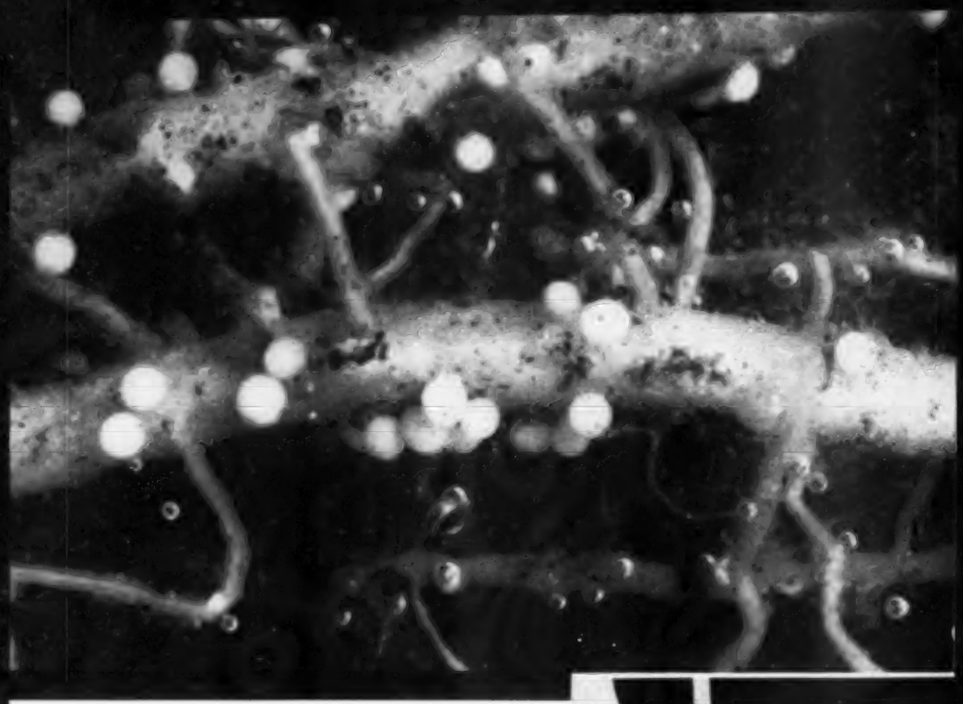
Mr. Rohwer said that the Bureau of Entomology and Plant Quarantine is recommending the use of DDT at 25 pounds per acre for control of Japanese beetle grubs. They are also using it in some control programs at a rate which may mean that 25 pounds of technical chemical soon will be applied to an acre. He asked Dr. Cullinan if this is going to affect germination of small grains, saying it is extremely important to know this. Dr. Cullinan replied "the tests have not been under way long enough to permit a clearcut answer. Available information suggests that where DDT insecticides were applied as recommended, and particularly where normal rotation is practiced, the deposit in the soil should not be of a nature to justify definite warning now against use, even where the more susceptible plants are to be planted." He added, however "this is something which needs careful and continuing consideration."

Dr. Lehman went into detail on toxicity tests made thus far on DDT, DDD, DMDT, benzene hexachloride, chlordane, toxaphene, and hexaethyl tetraphosphate. His summary follows: "The lethal dose for DDT ranges from 100 to 1,000 mg./kg. (average 500mg./kg.) when given orally to animals. If the value of 1 is assigned to DDT the other chlorinated hydrocarbons have the following estimated relative toxicity: DDD, 1/16 to 1/20; DMDT, 1/35; gamma isomer of benzene hexachloride, about 4; the other isomers of benzene hexachloride about the equivalent or

(*Turn to Page 65*)

*Dr. Cullinan's paper appears in full elsewhere in this issue.





Cysts of golden nematode on potato root . . . magnified many times.

TWENTY-SIX hundred acres of potato land in Nassau County, New York infested with the destructive golden nematode (*Heterodera rostochiensis* Woll.) constitutes a threat to the potato industry of the United States. The golden nematode is a new comer to this country. Except for the small infestation on Long Island, it is not known to occur on the North American continent.

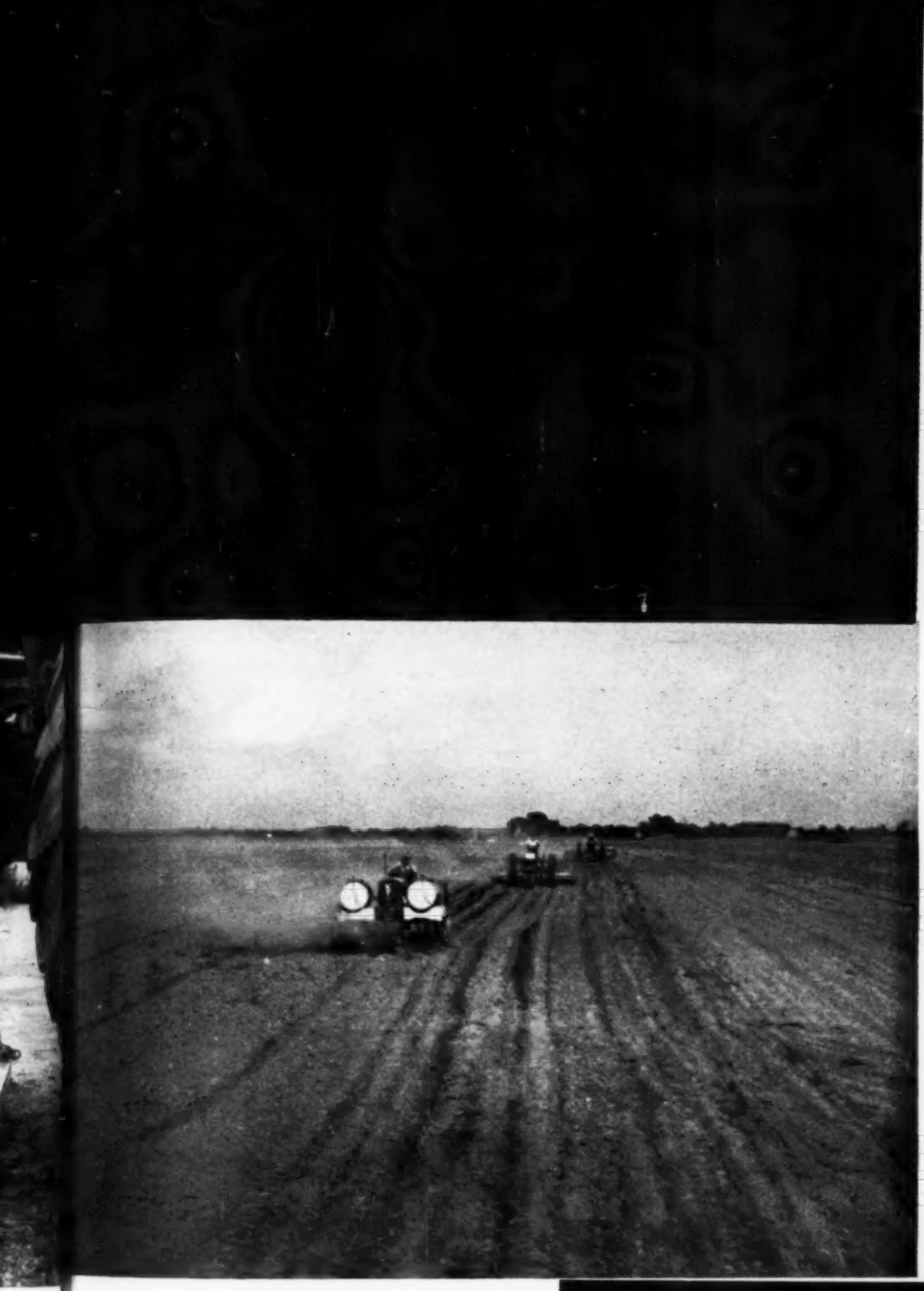
In 1934 a farmer near Hicksville noticed a few isolated spots in his potato field where the vines were stunted and off color. When harvested the tubers were small, many no larger than marbles. By 1938 these spots had multiplied both in number and size and the grower requested that a soil analysis be made, suspecting a soil deficiency to be responsible for the condition. In 1941 the potato growth was poor throughout the field in which these spots occurred. The difficulty could not be attributed to a mineral deficiency but the "potato sick" spots were determined to be infested with cysts of the golden nematode.

The golden nematode has been described as "a soil infesting organism, eel-like in shape, thin as the finest hair, and less than 1/50 of an inch long." In heavily infested soil thousands of them may attack the roots of a single potato plant. Upon reaching maturity the males die but the females, which have embedded themselves in the outer layer of the rootlets, eventually develop into tiny spherical cysts which may be seen with the unaided eye. These cysts may be white, cream, yellow, orange, or brown in color, according to age. Mature cysts, which are filled with eggs, usually become detached from the roots of the host plant and remain like weed seeds in the soil. When potatoes are again planted in the field a substance excreted from the roots stimulates fully developed larvae to hatch from the eggs and a new generation of nematode takes up the attack.

Tractor-mounted applicator to inject liquid fumigant into soil. Liquid applied under pressure in six-inch-deep furrows dug by blades set about 12 inches apart.

Action to Stop Spread

WHEN it was learned that the golden nematode of potato had gained a foothold on Long Island, immediate steps were taken by the State of New York, with the advice and assistance of the Bureau of Entomology and Plant Quarantine, to



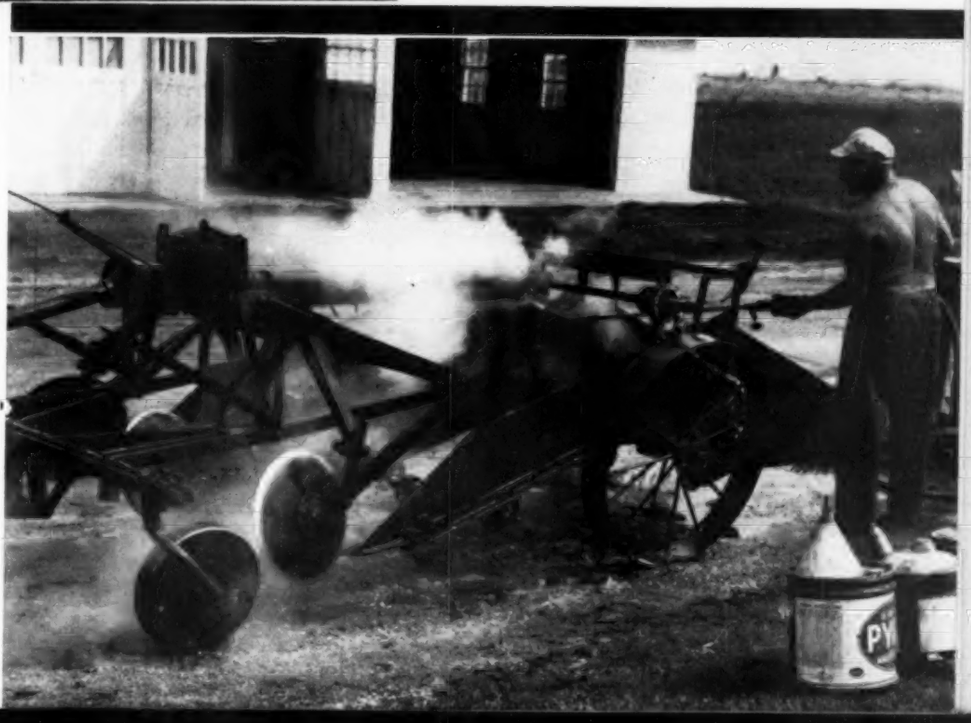
Following application of the fumigant, land is rolled to seal the material into the soil. Above is seen tractor-applicator injecting fumigant, followed by rollers.

prevent its spread locally, or to potato growing areas in other States. Only a few fields comprising about 40 acres were known to be infested in 1941. In 1942 these were covered by a State quarantine and an intensive survey was undertaken to determine the limits of light infestation in the Hicksville area. A soil sampling procedure was used to supplement visual inspection of potato fields during the growing season. By 1945 the infested area was known to involve 34 properties totaling 1,081 acres. At least another 1,000 acres had been directly exposed as a result of water draining from infested fields on to others, or by farm implements, including trucks and containers such as baskets and burlap bags, being used interchangeably between infested and non-infested fields.

In 1944 the Federal Bureau of Entomology and Plant Quarantine assisted in a survey of 19 northern States to learn whether the golden nematode was established elsewhere than on Long Island. In representative fields in centers of potato production in States as far west as Minnesota and North Dakota, plants were pulled and the roots examined. Particular attention was given to potato fields of poor stands or with spots or streaks of unthrifty plants, and to areas around loading and grading points and waste dumps. In making this survey, more than 48,156 acres of potatoes, involving 1,480 properties in 148 counties were examined. No golden nematodes were found.

With this additional evidence that

*This article includes information acquired by Dr. A. B. Buchholz, Director, Bureau of Plant Industry, Department of Agriculture and Markets, Albany, New York and Mr. Popham while investigating the more practical phases of the golden nematode (potato root eelworm) situation in England, Northern Ireland and Holland in November 1946.



Sterilizing farm machinery by use of steam after working in nematode-infested soil. All soil which may harbor these cysts must be removed from machine before it can be moved to a non-infested field.

the parasite was not generally prevalent in the eastern part of the United States, studies to determine more effective methods of eradication or suppression of the infestation on Long Island were intensified. Testing some 35 potential soil fumigants comprised a part of the golden nematode research program conducted by the Bureau of Plant Industry, Soils and Agricultural Engineering of the U.S. Department of Agriculture in cooperation with State research agencies. Among the more promising were Dichloropropene-Dichloropropane (DD); carbon disulphide; chloropicrin; and a compound 90% propylene dichloride, 10% methyl bromide ("Dowfume P"). Each gave a high degree of control but failed to eradicate even when effective control dosages were doubled and tripled.

In view of the above, and in recognition of the serious damage caused by the pest as reported in England and in other parts of Europe, the joint Federal-State program of suppression and prevention of spread undertaken in 1946 made provision for (a) the State of New York to compensate growers for taking out of production fields known to be infested with the golden nematode, (b) the Bureau of Entomology and Plant Quarantine to fumigate all such fields, (c) the regulated marketing of potatoes grown on land determined to be infested as a result of surveys conducted after the 1946 crop was planted; and (d) the continuation of an intensive survey of fields bordering the known infested area, and those that in one way or another had been operationally exposed.

L. I. Infested Acreage Doubled

INFORMATION developed in 1946 was not encouraging. The intensive surveys conducted jointly by the State of New York and the Bureau of Entomology and Plant Quarantine to determine the limits of the Hicksville area more than doubled the number of fields and the total acreage known to be infested. The number of fields operationally exposed had increased in proportion. The Bureau of Entomology and Plant Quarantine, using specially constructed tractor-mounted equipment had fumigated 1,543 acres—about 500 acres more than was known to be infested before the 1946 potato crop was planted. In spite of the effort made to regulate the marketing of potatoes, some from lightly infested and operationally exposed fields reached destinations other than those provided for in the quarantine, thus some new areas may have been exposed to infestation.

By the end of 1946 the problem on Long Island was assuming such proportions that there was urgent need for a reappraisal of control procedures before another crop season. More than 2,600 acres, involving 81 properties are now known to be infested. An additional 3,000 acres or more are operationally exposed and will require careful watching for several seasons. It must be expected that some exposed farms will be found infested when the next survey is made. New York State officials feel that to continue to compensate potato growers indefinitely on an annual basis for keeping infested land out of production is impracticable. Knowledge is lacking as to how long such lands must be kept out of potato and tomato culture to accomplish eradication. Experience has indicated that there is little purpose in treating lightly infested fields when the best soil fumigants available will not give complete eradication. These are a few of the more important factors considered in planning a program for 1947.

To supplement available information in regard to the potentialities of the golden nematode as a pest, and to learn of any new developments abroad that might be useful in dealing with the Long Island infestation, the New York State Department of Agriculture and Markets and the Federal Bureau of Entomology and Plant Quarantine sent representatives to the British Isles, and other points in Europe to consult with scientists, potato growers, representatives of marketing associations, and others directly concerned with potato and tomato culture in areas where the golden nematode has been a major pest for a number of years.

The situation that exists in England today should be ample warning of what potato growers of the United States may expect if the golden nematode is permitted to spread unchecked.

British Growers' No. 1 Problem

THE golden nematode (*H. rostochiensis* Woll.), or the potato root eelworm, as it is commonly called in Europe is prevalent in 65 to 75 percent of the fields in the more important potato growing areas of England. In an article appearing in the *Journal of the Royal Agricultural Society of England* in 1940, Dr. H. T. Leiper, a noted British scientist, wrote as follows: "By the early post-war period (First World War) practically all the potato growing districts of Britain were known to have foci of infestation. Since then infestation has increased progressively in intensity so that today much of the potato land is ceasing to be economically productive, and consequently its once high market value has markedly depreciated."

The potato root eelworm is reported to occur wherever potatoes are grown commercially in Scotland. In northern Ireland, the parasite is not widely distributed. However, 300 acres known to be infested have been taken out of potato and tomato culture by The Ministry of Agriculture which has authority to remove from production promptly any fields determined to be infested even when such action involves destruction of a crop.

The situation in Holland is similar to that of Ireland. Only limited areas are reported to be infested and these have been dealt with drastically. Both northern Ireland and Holland have undertaken to protect export seed industries which are based to an important degree upon certification that the potatoes were grown on eelworm free soil. From literature, it is evident that the potato root eelworm is a serious pest of potatoes in parts of Sweden and in northern Germany, but the extent to which it occurs in other countries of western Europe is not clear.

In conference with research workers in England it was learned that the particular phases of the nematode problem currently receiving the most attention included (a) soil sampling

and crop rotation to avoid planting potatoes in fields with a high cyst count; (b) soil fumigation to reduce the eelworm population to a level where potatoes may be grown profitably; (c) a search for resistant host material; (d) the development of a synthetic for stimulating hatching of larvae, thus shortening the host free period required to suppress or eradicate the parasite; and (e) a search for chemicals having a retarding effect on cyst development. The potato root eelworm now occurs in every important potato growing area in England. Eradication or even prevention of spread are secondary considerations. The immediate problem is to develop practical procedures for producing potatoes on infested soil while continuing research that may lead to more economical methods of chemical or cultural control.

More than 40 scientists, farm advisers, farm managers, and farm foremen were interviewed in England, Ireland, and Holland, in an effort to secure information that would be useful in dealing with the problem on Long Island. The information acquired as a result of these interviews may be summarized briefly as follows.

The golden nematode causes greater losses in the British Isles than any other pest of potatoes. It was first discovered in England in 1921. A soil sample from "potato sick" soil in Lincolnshire was found to contain viable cysts. Once known to occur, it was suspected of having been responsible for serious damage in some fields as early as 1916 and 1917. Those familiar with the situation in England feel that the golden nematode has been present in the British Isles since about 1900.

The spread of the golden nematode in England has been attributed largely to (a) using potatoes produced on infested soil for seed; (b) soil drifting from infested to non-infested fields; (c) moving transplants from infested soil to other fields; (d) using the same farm implements and containers in both infested and non-infested fields, and (e) the careless disposal of containers used in handling culinary potatoes grown on infested land.

Once a field becomes generally infested, potatoes or tomatoes can not be grown profitably more often than one year in five. On some types of soil it is unwise to plant potatoes more often than once in 6, 7, or 8 years. Ordinarily nematode damage is first observed in a few small spots in a field. These spots may appear to multiply and expand slowly but actually infestation is spread rather rapidly by cultivators and other ground working machinery.

Today 65 to 75 percent of the fields available for potato culture in the more important potato producing areas of England are generally infested. A generally infested field in Lincolnshire was kept out of potatoes for 7 years after which 3 crops were grown in 5 years. The first crop returned an excellent yield, the second only fair, and the third hardly returned the seed.

In 1931 a land owner in Yorkshire brought suit against a tenant charging "delapidation" of the soil. He charged that the potato root eelworm population had been permitted to build up to the point that potatoes could no longer be grown profitably. The landlord was awarded judgment in the amount of 6,000 pounds (about $24,000). Since then many of the contracts between land owners and tenants in eelworm infested areas contain clauses fixing responsibility in case of extensive eelworm damage.

Many farmers in Yorkshire and Lincolnshire will not plant potatoes without a soil analysis to determine the potato nematode count, and few farms in these areas change hands without the prospective buyer arranging for a soil analysis to determine the prevalence and severity of golden nematode infestation. The golden nematode appears to thrive in any climate and in any type of soil which is suitable for potato culture.

In experimental plots in England, certain soil fumigants have given a 65 to 75 percent reduction in viable golden nematode cysts. However, the treatment is expensive and the benefits may be of short duration if the land is continued in potato or tomato production.

In northern Ireland and in Holland, the Ministries of Agriculture have authority to remove promptly from potato and tomato culture any fields determined to be infested with the golden nematode, even if such action involves destroying a crop.

There was little variation in the opinions of those interviewed with reference to (a) the importance of the parasite as a pest of potatoes; (b) the possibilities that exist for its eradication once it becomes established in a field; and (c) the desirability of initiating measures to prevent spread from known foci of infestation to other potato growing areas. Technical men who have had years of experience with the problem were in general agreement that the golden nematode causes more damage in England than any other pest of potatoes. In their opinion there is very little hope of completely eliminating infestation from the soil without discontinuing the production of potatoes and tomatoes for an indefinite period. Opinions were unanimous concerning the desirability of preventing spread while continuing to search for more economical methods of control.

Summary

WITHIN 30 years after the golden nematode was discovered in England it had become recognized by farmers as the most destructive of all pests attacking potatoes. Nematode infested fields were to be found in every important potato producing area. Fields that have become generally infested will produce a profitable crop of potatoes only one year in five. Under certain conditions the period between potato crops must be extended to six to eight years. The golden nematode will attack only the roots of potatoes and tomatoes.

The golden nematode will live in the soil for eight or more years without the presence of host plants. Any natural or mechanical movement of soil from infested fields may result in spread of the parasite to new areas. The most effective way to stop spread is to take infested land out of potato and tomato production for an indefinite period. Soil fumigation with certain chemicals will reduce but not eradicate infestation.

The only golden nematode infes-

(*Turn to Page 69*)

FOR THE EXCLUSIVE USE OF

INSECTICIDE MANUFACTURERS

. . . PRENTOX PEST-TESTED CONCENTRATES

SPRING . . . the time of planting for the farmer . . . is the time of fruition for all of us engaged in supplying his needs. Formulations are set. Manufacture, packaging, distribution are well along. Now your plans and budgets, so carefully laid, can be measured by actual field experience.

As you prepare to move out into the fields, we solicit your cooperation. We, essentially, are raw-material producers. It is our function to make available the active constituents in your finished insecticides. Correct forms, properly-balanced properties, adequate supply and scheduling, these are the things which we can do to help.

But these we can best learn from the field performance of the finished products in your hands. To concentrate on the manufacturing of consistently high-quality materials occupies our full capacities. We must therefore look to you for the exact interpretation of field requirements which alone can guide the progress of insecticides toward ever more effective service.

Thus, in field, orchard and barn, on the range, the feed-lot and in the granary, Prentox Insecticide Concentrates are proved and improved *with your experience as the final control.* Prentox products are for the exclusive use of insecticide manufacturers . . . are directly geared to your own formulation requirements. That is why our technical staff is at your disposal, with your specifications controlling their efforts. By such cooperation, outstanding results are assured.

MICRO MESH DDT POWDERS

PYRETHRUM PRODUCTS

ACTIVATED SABADILLA

ROTENONE POWDERS

LIQUID DDT CONCENTRATES

BENZINE HEXACHRLORIDE

FORTIFIED RED SQUILL

PRENTOX CONCENTRATE

R. J. PRENTISS & CO., Inc.

110 WILLIAM STREET, NEW YORK 7, N. Y.

9 SO. CLINTON STREET, CHICAGO 6, ILL.

• **SEE PRENTISS' BUG-OF-THE-MONTH AD ON INSIDE BACK COVER**

Fertilizer Problems of California Orchards

By E. L. Proebsting
University of California

NUTRITIONAL problems presented by California orchards are of greater variety than those of any other state. The number of fruit species grown, the diversity of soil types and the variation in climate make a "tailor-made" fertilizer practice for each orchard desirable. Cultural procedures such as pruning method, irrigation and soil management also affect the nutrition of the tree, and, therefore, fertilization.

It is not generally appreciated that different kinds of fruit trees behave quite differently on the same soil medium, and often still less like annuals under the same conditions. For example, in certain areas in the Sacramento Valley, peaches and almonds are grown successfully without fertilization in the same fields where prunes died because of nutritional disturbance. Peaches commonly respond to the addition of nitrogen to soils in which pears or prunes fail to show benefit. Not only do we encounter such differences between species, but there may be differences in nutrition of the same variety on the same soil when grown on different rootstocks. The apricot may have twice as high a concentration of potassium or nitrogen in the leaves when grown on apricot root as when its stock is peach. It has been similarly shown in England that the same variety of apples on one apple stock is normal while on another in alternate plots, it shows the leaf scorch associated with potassium deficiency.

California soil types show a wide variability depending on their parent material and the conditions under which they have developed. Some 300 soil series have been described, many of which occur in several textural types. Not only the chemical composition but the depth, structure, drainage, etc. modify the nutritional behavior.

Another factor of importance is climate. Annual rainfall varies from about one inch in certain desert areas to well above one hundred inches in the north coastal area. Temperature records show areas ranging from frost free locations to those having less than 90 days' growing season. Light may be softened by ocean fog in coastal areas or reach great intensity in the interior. It has been established that the ability of the tree to utilize nutrients is greatly influenced by these variables.

These remarks should serve to bring out the complexity of the problems faced by those giving advice on fertilization to California fruit growers. The natural reaction to the situation is to search for some short-cut, to look for some way in which the behavior of the tree can be predicted easily and accurately. The method of soil analysis has been tried over a long period of years. It fails because it can evaluate, at best, only the supply of a set of nutrients and ignores all of the other factors enumerated above. A good example of this difficulty is found in an orchard, part of which has limited root penetration because of a water table. The soil analyses from the two areas were essentially the same, but the trees with the limited root distribution responded to fertilization while the others did not. Soil analysis is a useful tool, but is not a sound guide for general recommendations.

A much more promising method of attack lies in tissue tests. Various portions of trees have been analyzed for different elements and the results correlated with tree behavior and fertilizer treatment. The results have been useful, especially on experimental plots. Leaf analysis has shown, for example, whether mobile materials added to the soil or those subject to fixation placed in the root zone, have been absorbed and translocated to the above-ground portions. They have suggested areas where, because of low values, experimental plots might be established. They have given rather sharp limiting values for deficiencies of some minor elements for some species of trees.

Tissue analysis has not given a basis for specific fertilizer recommendations, however, and seems unlikely to serve as a final criterion for a field program. Various factors that modify accumulation may be of greater importance in the value found in leaves than the supply in the soil. It has been found that the same variety of apricot propagated on two rootstocks and grown in alternate rows, may have twice the potassium content in its leaves on one stock that is found in the leaves of the trees on the other. It has also been found that trees bearing a heavy crop usually have lower potassium content in their leaves than non-bearing trees. Insect attack often causes marked changes especially in the nitrogen content of leaves, and may obscure completely the results of treatment. For the specific purpose of determining what to add to the soil of a given orchard, the use of tissue tests must be supplemented by other means.

Another modification of the traditional concept of fertilization has occurred within the last twenty years. Many California orchards have an ample supply of the three major elements, but may lack minor elements.

These considerations are the basis for the policy of not making general fertilizer recommendations but treating each orchard as a separate problem. As our agriculture becomes older, more orchards will require more elements, and more of each element, but an individual diagnosis will still be needed.★★

Another agricultural chemical
Baker's BENZENE HEXACHLORIDE

This new powerful insecticide promises much in the agricultural field!

From wartime research comes one of the most potent insecticides known—Benzene Hexachloride ($C_6H_6Cl_6$) or 1, 2, 3, 4, 5, 6-hexachlorocyclohexane.

As a stomach poison, contact poison and fumigant, Benzene Hexachloride kills some insects unharmed by DDT. For certain other insects, it is more effective than DDT.

In the agricultural field Benzene Hexachloride has shown special promise for use against cotton insects—boll weevil, flea hopper, aphid, and the leafworm. An early report shows that it increased yields of seed cotton 750 pounds per acre.

Among the many insects susceptible to Benzene Hexachloride are grasshoppers, mites, chiggers, mosquitoes, flies, beetles, weevils, moths, lice and cockroaches.

Benzene Hexachloride appears at present to be relatively harmless to man and warm-blooded animals. It is chemically stable and is unaffected by continued exposure to the atmosphere. It is more volatile and less persistent than DDT.

Benzene Hexachloride can be easily formulated into dusts or pastes, liquids in suitable solvents, emulsions or "smokes."

The J. T. Baker Chemical Co. is now ready to supply limited quantities of Benzene Hexachloride for manufacturing purposes.

Write today for prices. Address the *Agricultural Chemical Division,* J. T. Baker Chemical Co., Executive Offices, Phillipsburg, N. J.

Baker's Chemicals

C. P. ANALYZED • FINE • INDUSTRIAL

Need for

SPRAY CHEMICAL INFORMATION

As viewed by a

Custom Sprayer

By F. L. PARR

Freeman L. Parr, the author and his partner, Peter N. Hanson, are arborists who founded Parr & Hanson at Hicksville, Long Island, in 1931. Both are graduates of the Davey School at Kent, O. Mr. Parr has been in the custom spraying business for 21 years, starting with Davey and subsequently teaching at the Davey School. The firm which was incorporated last year specializes in shade trees and commercial orchards. Its spraying equipment comprises two Farquhar units and one large Bean unit, the latter a 60 gal. per minute machine for trees up to 100 ft. tall. Mr. Parr believes that the custom sprayer has an important role in the job of interpreting and disseminating technical information on spray chemicals. This job must be done promptly and thoroughly to aid the more rapid and effective use, especially of new chemicals, by commercial interests. But as in the practical application of the findings of all scientific research, here too haste must be made slowly.—The Editors.

SPRAYING of shade and fruit trees in the United States has become big business and the tonnage of chemicals consumed in it has grown to large proportions. This work is done by large companies who own fifty or more spraying machines and numerous other concerns who own fewer machines. This latter group may include the small operator with only one machine, or the farmer or orchard man who sprays his own crops. Out of all these firms and individuals doing spraying, only a few of the larger ones can afford to have on their staff research men, entomologists, plant pathologists, and chemists who spend their entire time with spray chemicals, testing and recording the results for their own use. It is evident that most operators must rely on state and federal experiment stations for their information on new spray materials, or try them out by the trial and error method themselves.

Probably, very few chemists are in the business of commercial spraying, so it is unlikely that such spray men understand thoroughly the composition chemically of the materials they use. This is a serious handicap which ordinarily reading of the technical literature cannot overcome. There was a time in the not far distant past when the custom sprayer had a half-dozen standard materials which he knew only by name. He could use these materials and say with a great deal of truth that this small number of materials would give the best spray results that money could buy.

Since the war, however, there has been a deluge of new spray materials from DDT to benzene hexachloride, which have made it far more difficult for the average operator to know just where he stands. When the chemist dreams up some unusual combination that has possibilities in the field of insect or fungus control, it is a long road with many turns and stopping places before the man who uses the material is able to secure

commercial quantities and start using it under actual field conditions. Let us take, for example, what actually happened in the case of DDT. There were stories, rumors and publicity enough to fill many a book, but in all this reading matter it was impossible to find a simple report such as the following example:

"On May 1st, using Standard Sprayer at 500 pounds working pressure, we used 50% wettable DDT—2 Pounds per 100 gallons — washed through screen into tank. Area sprayed was badly infested with canker worms. Trees were sprayed and the spraying checked as follows:

1st day — report only few worms alive.

3rd day—no worms alive.

Two weeks later—no reinfestation.

No spray injury to foliage or surrounding plants.

Spray material still present on leaves and tests show it strong enough to kill insects coming into contact with it."

Such information as the above in that form might have been made available to the men who are engaged in spraying. Such information does not hold the experiment station liable and gives the commercial spray man a basis on which to work out his own requirements under actual spraying conditions.

The duty of every firm or individual who sells spray service to the public is to give them the best in spraying materials that the country's manufacturers have to offer and try to give the best complete results possible. This does not mean, however, to wait five or ten years until every little technical twist has been taken out of the spray composition. The sprayer should pledge himself to record results under actual field conditions for the good of all. The possibility of serious damage is not great if he has a basis of advance information to work on,—reasonable assurance that the material will not damage foliage or flower, that it is not unduly harmful to the operator, and that it has a better-than-average chance to give better control. From this point on, the practical spray man may take the material and try it under actual field conditions, using or rejecting it for his own exacting needs as he sees fit.

Education Needed

AN important field of writing is that which interprets technical language so that it may be understood by all engaged in the use of spray chemicals. As time goes on, it becomes increasingly important for the commercial sprayer to keep abreast of new developments in the field of insecticide and fungicide chemistry. This interpretation of technical developments can be aided to a marked degree by the firms engaged in the sale and testing of these materials. They should supply in understandable lay language the following information:

1. A description of the material and for what use intended.

2. The characteristics of the material and its relation to water.

3. Does it mix readily?

4. Is the material packaged so that it can be placed in the spray tank in proper amounts and without measuring or weighing?

5. Does it require a spreader or sticker or safener?

6. What other materials can it be combined with?

7. Complete charts of amounts to be used for each 100 gallons of water.

8. Precautions to be taken by the operator.

9. Its effects on humans and animals.

10. Its reactions to high and low temperatures.

11. Can the material be stored safely over long periods?

12. Does the material leave an objectionable odor or stain?

13. Does the material change chemically over long periods?

14. How long will the material remain effective on the leaf or plant?

That the man engaged in spraying should secure these facts as a basis on which to conduct his own spraying is obviously important. Operators who spray on private properties have more than just the effectiveness of the material to consider. If the spray, for example, stains the paint or brick on the house, it cannot be used. If it has a lingering, objectionable odor, its use may be limited. If the color spoils the appearance of the foliage, there is always the point of tolerance — to choose the lesser evil—the insects or disease, or the spray chemical.

In spray chemical information, there seems to be a large gap between the chemist and the manufacturer, the distributor and the user, whether it be the farmer, the orchard man or the commercial sprayer. The ultimate aim of all is better plant life through the use of spray chemicals. With wider distribution of *understandable* information, much is to be gained in this direction through increase in knowledge. ★ ★

Experiment Station Digest

By H. H. Slawson

INVESTIGATION of problems involved in the use of DDT was given major emphasis in the 1946 entomological research program of the New York State Agricultural Experiment Station, Geneva, N. Y. This was made evident in the brief progress reports of accomplishments included in the station's annual review of its work for the 1946 fiscal year, recently released.

Codling moth control with DDT has been "unbelievable," S. W. Harman of the entomology department declares in detailing his tests of new and promising spray materials designed for the summer spraying of apples. In the heart of the Niagara county fruit growing area, where a resistant strain of codling moth has developed, it has been impossible, Harman stated, to control this pest satisfactorily with the most efficient lead arsenate sprays. Yet five cover sprays of DDT produced fruit 99 percent free of both worm and sting injuries as compared with 35 percent culls from codling moth damage after a summer program of ten lead arsenate sprays, he said.

In other localities similar results were obtained. No injury to fruit or foliage resulted from the DDT and spray deposits at harvest were all within tolerance requirements. These data, Harman says, "suggest a possible solution of the spray residue problem through use of DDT on apples and pears in the western New York fruit belt."

In using various spray mixtures for control of raspberry fruit worm, tests with DDT and cube gave 83 percent control on the Latham variety and 74 percent on Newburgh plants, while ground cube gave 71 and 67 percent control respectively. Lead arsenate gave 36 percent control on Newburgh. These data, it is pointed out, confirm earlier results with rotenone-containing products and indicate that rotenone is a possible material for control of this fruit worm after the fruit has formed, while use of DDT seems to afford the best means of protection for application previous to blossoming.

In tests of rotenone, "Ryanex" and DDT against the gooseberry fruit worm on gooseberries and currants, "Ryanex" gave poor control, the report states. Rotenone gave 82 percent control while DDT gave 88 percent control at the rate of 0.4 pound, and 97 percent at the 0.8 percent pound rate of application. All materials were used in bordeaux mixture (3-3-100).

Fifteen dusts were applied with a hand duster to small plots of the berries and where used with "Ryanex" this fungicide was found to reduce the effectiveness of rotenone and tri-basic copper sulfate. "Fermate" reduced the control of "Ryanex" but did not affect control by rotenone or DDT. "Rotenone," says the report, "is the only insecticide that can be recommended at present, either as a dust or spray for gooseberry fruit worm." DDT appeared "promising," but further studies seemed advisable on residues and effectiveness.

Various insecticidal mixtures were applied against the rose chafer in grape vineyards, and where DDT was included in the formulations considerable gain in production resulted as compared with check plots. One surprising result was the absence of grape leafhopper for the remainder of the season on vines sprayed with DDT, this being attributed to its residual effect.

In studies of organic insecticides for repression of cabbage thrips, the Geneva investigators concluded that DDT was "outstanding" and showed "a very marked superiority over rotenone, pyrethrum, "Ryanex" and benzene hexachloride." DDT was also more effective against the imported cabbage worm and cabbage looper than were arsenicals or benzene hexachloride. Little difference was found in effectiveness between dusts of 1 and 2% DDT content applied at 30 lbs. per acre. DDT was rated as of "no value" for cabbage aphid control. The only other material appearing to effect control was benzene hexachloride, although a 3 percent formula which gave almost perfect control of aphids and thrips had little effect on caterpillars of the cabbage looper and imported cabbage butterfly.

Report is made on the merits of DDT applied as spray and dust for control of aphids and thrips in cauliflower seed beds and against various caterpillars infesting the fall crop, in comparison with recommended treatments containing rotenone or pyrethrum. In field tests it was concluded, DDT sprays did not equal DDT dusts in caterpillar control, where the concentration was moderately high. At lower concentrations results favored treatment with sprays. While DDT is excellent for insects attacking cabbage foliage, it was decided that further work must be done on the question of harmful residues.

Studies were made at Geneva of various problems connected with insecticidal control of European corn borer and details are given of use of various insecticidal dusts applied by tractor and by hand duster. Other topics touched on in the Geneva station report are concerned with (1) the biology and control of European chafer, as related to the nursery industry, ornamental plantings and turf areas; (2) biology and control of the fruit tree leaf roller; (3) control of apple aphids with special reference to sprays effective against the European red mite.

In studies to improve the fungicidal and insecticidal effectiveness of dusts, the Geneva station reports that "contrary to common belief, it was found in testing new types of spray-dusters, that most materials stick better when applied as dusts than as sprays. Poor control, it is claimed, "is nearly always caused by poor deposition rather than by poor adherence."

The principal advantage of spray dusting over dry dusting, the report continues, is that a high initial

(*Turn to Page* 71)

WHERE GOLD

GROWS ON TREES . . .

they use Kryocide

REG. U. S. PAT. OFF.

Natural **CRYOLITE**

For many years, Kryocide has been a favorite insecticide with citrus growers of California . . . just as it has been with apple-growers in the Northwest . . . Southern peanut farmers . . . and truck farmers everywhere.

That's because Kryocide has *proved* itself effective against so many common chewing insects, and is so easy and economical to use as dust or spray.

Pennsalt, leader in the development of cryolite insecticides, produces Kryocide and other agricultural chemical products "from the ground up." Today, Pennsalt is one of this country's leading basic producers of chemicals for agricultural use . . . and one of your best and most dependable sources of supply. Write us for full information on Penco agricultural chemicals.

PENCO DDT Products

Penco WB-50—micron-sized, wettable powder for water sprays

Penco DB-50—for dust manufacture

Penco Cattle Spray—for livestock and barn sprays, livestock dips

Penco Emulsion Concentrate—for water emulsion sprays

PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals
1000 WIDENER BUILDING, PHILADELPHIA 7, PA.
TACOMA, WASH. BRYAN, TEXAS

PENCO
AGRICULTURAL CHEMICALS

The Listening Post

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey, Bureau of Plant Industry, Soils, and Agricultural Engineering, United States Department of Agriculture, Beltsville, Md.

By Paul R. Miller

GREAT interest has been shown in following the course of plant diseases which caused damage in 1946 and may recur to some degree this year. Following is some information on tomato late blight and blue mold of tobacco:

Development of Late Blight

ALABAMA. In Alabama late blight (*Phytophthora infestans*) overwintered on tomato plants in the vicinity of the Gulf Coast Substation at Fairhope.

FLORIDA. In Florida, late blight was found in the Hastings area on several potato farms about a month earlier than usual (reported February 10). It was thought to have spread from tomatoes. Before this, the disease had been general on potatoes and tomatoes farther south in the State. Late blight and rains caused heavy reduction in yield of the fall crop in the Everglades. Rains interfered with the spray program and restricted opportunities to obtain information on the effectiveness of fungicides. Tomato seed beds in the Sanford area became generally infected during the latter half of January and plants in most beds were destroyed. Freezes in the early half of February severely damaged or killed potato and tomato plants in the lower east coast and Hastings areas. Before the freezes, late blight in the lower east coast area had been brought pretty well under control by thorough applications of "Dithane," copper sprays or dusts, or combinations, at 3 to 5 day intervals. Cold damage was less destructive on the west coast, where late blight had not yet become generally prevalent in tomato spring crop plantings, and growers were spraying and dusting according to a regular schedule. Low temperatures have so far inhibited activity of the fungus in some localities, and in others it is possible that new infections were obscured by the cold damage.

TEXAS. In Texas there has not been a trace of late blight so far this season on either potatoes or tomatoes in the Lower Rio Grande Valley.

LOUISIANA. In Louisiana, at Lafayette, late blight was observed on leaves and stems of nearly mature and seedling tomato plants in a greenhouse late in February. Its presence constituted a serious menace to the spring crop, since few growers in this area practice control measures.

Development of Tobacco Blue Mold

THE reports from which the following summary was compiled indicate a generally discouraging tobacco plant situation at the time of the observations.

FLORIDA. By the middle of March blue mold was generally distributed in the flue-cured area of Florida. Success in holding it under control with "Fermate" dust seems quite variable: some growers think it has done no good, others have held damage to a minimum. Frequent rains have probably interfered with timeliness and effectiveness of application.

GEORGIA. At the beginning of March it was estimated that 35 to 40 percent of Georgia flue-cured tobacco plants had been killed or were dying from freezing weather in February, and another 10 to 15 percent had al-

(*Turn to Page 71*)

Insect Conditions, Late March, Early April

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

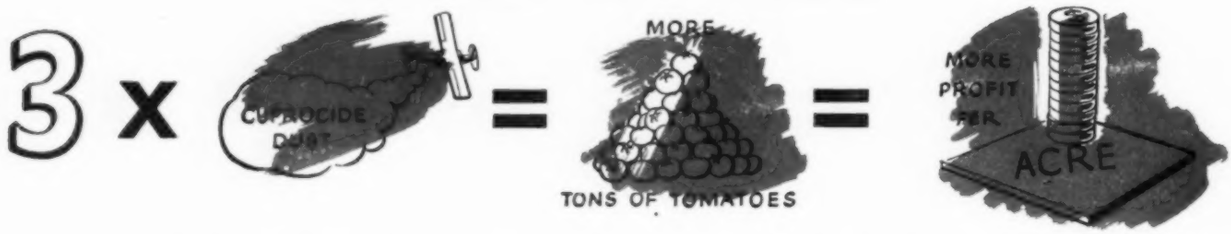
By G. J. Haeussler

ONLY very light infestations of cabbage caterpillars were reported generally up to the middle of April in the southern Atlantic Coast states, although occasional plantings in Georgia are sufficiently infested with diamondback moth larvae and cabbage loopers to require insecticide applications. During the second week of April light to moderate infestations of the diamondback moth and imported cabbageworm were reported on cabbage in Mobile County, Alabama. The latter insect was appearing at that time in the Baton Rouge section of Louisiana, where larvae averaged less than 1 per plant on the larger cabbage plants. A few cabbage loopers and cabbage worms were reported on cole crops in southern California but were said to be causing little or no damage.

During the latter half of March small black chrysomelid beetles were discovered causing considerable injury to newly set cabbage plants in one garden in the Springhill section, located in the suburbs 4 miles west of the city of Mobile, Alabama. These were identified as *Microtheca ochro-*

Want Bigger Tomato Crops?

IT'S SIMPLE ARITHMETIC!



Once again conclusive tests prove the effectiveness of a systematic DITHANE or YELLOW CUPROCIDE control program . . . show how these superior fungicides protect tomatoes from early and late blight and anthracnose . . . result in bigger and better crops.

Delaware growers who sprayed their fields with DITHANE D-14 or dusted them with YELLOW CUPROCIDE, found a *direct relationship* between the number and type of sprayings or dustings and the resulting tonnage of tomatoes and actual profit to them.

Here are the results of Dithane Spraying

Number Applications	Number Acres Treated	Average Tomato Yield Per Acre		Increase over Untreated Tons per acre
		⅝ Baskets	Tons	
1. One Dithane D-14 Spray + 1 dusting	24	622	10.36	6.71
2. One Dithane D-14 spray	60	437	7.28	3.63

Here are the results of Yellow Cuprocide Dusting

Number Airplane Applications	Number Acres Treated	Average Tomato Yield Per Acre		Increase over Untreated Tons per acre
		⅝ Baskets	Tons	
1. Untreated	244	219	3.65	....
2. One Application	159	401	6.68	3.03
3. Two Applications	83	618	10.16	6.51
4. Three Applications	37	749	12.48	8.83

This simple arithmetic adds up to just one fact . . . that DITHANE D-14 or YELLOW CUPROCIDE, used in a systematic program, has increased tomato crops.

YELLOW CUPROCIDE sticks to the plants like glue, has one of the smallest particle sizes and the highest copper content of any copper fungicide on the market.

Write us for literature describing these products.

DITHANE and CUPROCIDE *are trade-marks, Reg. U. S. Pat. Off.*

Represented by Cia. Rohm y Haas, S.R.L., Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities.

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Manufacturers of Chemicals including Plastics • Synthetic Insecticides • Fungicides • Enzymes • Detergents
Germicides • Chemicals for the Leather, Textile, Ceramic, Rubber, Paper, Petroleum and other Industries

loma Stal, a serious pest of crucifers in Argentina and Uruguay. A subsequent survey disclosed this newly-discovered pest to be well distributed within the city area of Mobile and in a surrounding area, the limits of which have not been determined. Specimens were also collected at Theodore (9 miles south west of Mobile) and about one mile north of the city limits of Mobile. Besides cabbage, the species was found feeding on collards, turnips, and radishes. The infestations, mainly on garden plantings, varied from light to severe. Nearly all the heavy infestations were confined to turnips. Present information regarding the abundance and distribution of the insect in that area would appear to indicate that the infestation may be of some years standing. A rather heavy application of rotenone dust, 0.75 percent concentration, to the infested cabbage planting at Springhill, is reported to have apparently killed all beetles and the few larvae present.

The vegetable weevil has continued to cause some damage to turnips and related crops in small plantings in Georgia and Florida. Generally light infestations on tobacco plant beds in northwestern Florida have been controlled in most instances with lead arsenate. The larvae caused considerable injury to the seedlings in a few cases where insecticide applications were delayed.

The first Mexican bean beetle adults of the season were observed in the field on young snap beans in northern Florida and southern Georgia during the first week in April. The following week the first adults were observed in South Carolina. Adults were beginning to emerge in hibernation cages at Ventura, California, but none were observed in the fields in Ventura County. Adults had become more numerous by that time in Georgia and Florida, with egg deposition started and injury rapidly becoming severe in some Florida garden plantings.

Light to moderate infestations of the bean leaf beetle and of spotted and banded cucumber beetles were present on beans in South Carolina, Georgia, Florida, and Alabama in early April.

Black chrysomelid beetles, South American crucifer pest, found infesting cabbage in Mobile, Alabama, area. Heavy applications of rotenone dust thought to give control.

Moths of the red-banded leafroller began emerging in apple orchards in southern Indiana on March 31 and began depositing eggs on April 5. Occasional moths were also observed in southern Illinois in early April.

Eggs of the European red mite are reported present in most New York and Pennsylvania apple orchards but are apparently not much more abundant than last year. Hibernating two-spotted spider mites are present in many eastern New York orchards that were sprayed with DDT last season, though winter mortality varies from 50 to 80 percent. This same mite was causing some injury to strawberries in eastern Virginia and southern California toward the middle of April. A rather heavy mite infestation (species not indicated) is said to exist in orchards throughout the Door County and eastern sections of Wisconsin.

Toward the middle of April light infestations of the pea aphid were reported on peas from southern Alabama, the Charleston district of South Carolina, and in Ventura County, California. In the Norfolk, Va., district no aphids had been found on peas up to that time but pea aphid populations on alfalfa were said to range from about 80 to 100 per sweep. At the same time, cabbage aphid infestations were becoming severe on cole crops in southern California and the turnip aphid was causing serious injury to young cabbage plants in some parts of Louisiana. Aphids were reported abundant on squash, potato, celery, pepper, cowpeas, in Florida. Infestations of the green peach aphid became so severe during late March and early April on sugar beets grown for seed in the Safford, Arizona area that insecticide applications were imperative. Practically all fields were dusted with 2 percent benzene hexachloride dust. Serious infestations of that aphid in tobacco plant beds were reported from the High Springs—Fort White district of Florida toward mid-April.

Apple aphids were reported hatching early in April in many orchard areas in the eastern half of the country, including New York, Pennsylvania, Kentucky, southern Indiana and southern Illinois.

An intensive survey conducted during January, February, and March in 48 counties in the extreme southern portions of Texas revealed that the screwworm survived the winter there in not more than 19 of the counties. The western portion of the screwworm survival area along the Rio Grande River apparently did not extend beyond Webb County this year, whereas in previous winters it extended 50 miles northward into the Pecos River Valley of Val Verde County. In the central portion of the area, winter breeding of the insect extended northward at least as far as La Salle and McMullen Counties and the Nueces River Valley of Frio and Uvalde Counties. It is questionable, however, that true screwworms actually overwintered in the latter two counties. Along the Gulf Coast area of Texas the insect was active as far north as Nueces County, which is approximately the extent of the survival area in previous winters. The area in Arizona in which this insect survived the winter has not yet been determined.

Reports from the manufacturers of screwworm smears indicate that the supply of ingredients now on hand for "Smear 62" and the newer "EQ Smear 82" is ample to meet the present demand. Firms that supply the major portion of "Smear 62" in Texas are beginning to manufacture "EQ Smear 82" in small quantities and expect to increase its manufacture to the extent that any emergency may still be met even though any of the ingredients of "Smear 62" become unavailable.★★

These **FACTS** *about*

Compatibility

are important to every manufacturer and user of dust and spray chemicals

Before combining two or more dust or spray chemicals for application to plants, it is important to know whether the materials can be used together conveniently, safely and effectively. This is possible only if the materials are "compatible"—a term which covers three distinct conditions:

Chemical Compatibility

▶ This refers to the reaction which may take place when two materials are combined. If they do not react with one another in such a manner that their effectiveness is impaired, they can be considered chemically compatible.

Physical Compatibility

▶ When physically compatible materials are combined, they form mixtures which can be applied efficiently in all commercial types of applicators. Spray materials should mix readily and give uniform coverage without excess "run-off." Dusts should be free-flowing.

Biological Compatibility

▶ This is the ability of one material to mix with another without reducing the effectiveness of either and without causing injury to the plant on which the mixture may be applied.

Du Pont Dust and Spray Materials, which would normally be used together, are formulated to be compatible chemically, physically and biologically. A chart on the compatibility of Du Pont dusts and sprays may be obtained by writing to the Du Pont Company, Grasselli Chemicals Dept., Wilmington 98, Delaware.

Raw Material Markets . .

SUPPLIES of agricultural chemicals, in both fertilizer and insecticide fields, appear to be improving gradually although certain factors tend to dim the prospect of abundance. Foremost among the latter is the continuing boxcar shortage which has prompted the Government to recommend that cars be loaded to capacity, loaded and unloaded as rapidly as possible, and that other forms of transportation be used when possible. In the insecticide field, a shortage of certain raw materials and of various types of containers add to the transportation difficulties common to nearly all interstate business.

Distribution of insecticidal materials is being hampered at the heaviest buying season by the tight boxcar situation, with a lack of containers also a contributing factor. Demand continues strong, not only in the United States, but in other parts of the world as well. New Zealand's imports, for instance, during February to November, 1946, amounted to more than twice those in the corresponding period of 1945.

Locust-infested countries of Palestine, Iran, Greece and some African areas are scheduled to receive some 200,000,000 pounds of benzene hexachloride from the United Kingdom. Demands for insecticides of all types are heavy in the United States for the 1947 season. But supplies are not adequate in all cases.

Of the arsenicals, paris green alone is considered in sufficient supply to meet probable demand. White arsenic, and calcium and lead arsenate are all in tight positions. In the case of white arsenic, domestic production is below capacity, and although most of the supply is being channeled to the insecticide industry, barely enough stock is in sight to meet requirements. January 1947 imports were 16 percent above January 1946, however. A shortage of raw material is given as the chief cause for current short supply of calcium arsenate. January's output of calcium arsenate was more than twice the December production, and was 85 percent above January, 1946 production. Heavy exports cut deeply into this increased production however. Some 202,000 pounds were shipped to foreign buyers in January, 1947, as compared with 78,000 pounds in January, 1946.

Prices are fluctuating upwards in both calcium and lead arsenate, each commodity being sold subject to the price in effect at time of shipment. January's production of lead arsenate was 4,923,000 pounds, which was 32 percent above the December output. It was somewhat lower than the figure for January, 1946, however.

Rotenone appears to be in good supply, although the 1947 demand is expected to exceed that of any previous year. The Bureau of Entomology and Plant Quarantine estimates that almost 3,000,000 pounds of 5 percent rotenone will be required for treatment of livestock alone during the season. After some uncertainty of supply during past months, the tonnage brought to the U. S. from Peru has exceeded the minimum guaranteed by the Peruvian government, which has caused the termination of the agreement. (The agreement called for 8,000,000 pounds of cube, and the amount actually delivered exceed this figure by a considerable amount.)

Pyrethrum supplies offer no problem, with the 1946 receipts totaling 12 percent more than the 1945 imports. Against this were light exports, amounting in January to only 2,000 pounds as against 20,000 pounds a year ago. Fears of a possible curtailment of supply due to blight in Kenya are alleviated by word that the disease is being brought under control and there is likely to be no decrease in either quantity or quality from that source in 1947.

Although the production of DDT in the U. S. is reported to be "running high," the demand is still higher, resulting in a tight situation. January's output of DDT was 4,092,000 pounds, 5 percent above the December figure. Somewhat the same story is true of nicotine, which remains in short supply. Exports of nicotine sulfate totaled 23,600 pounds in January, 1947, as compared to 5,000 lbs. a year ago.

Copper sulfate fungicide appears to be in adequate supply. Growers are reported to have acquired sizable stocks to meet the coming season's requirements. With stocks now built up, demand has dropped off.

Fertilizers

AS stated previously, distribution is the bottleneck in the fertilizer market. Despite this, however, deliveries of mixed fertilizers are running a month ahead of last year. While regional shortages of fertilizer are in evidence, the over-all supply is expected to exceed all previous records. (The regional inequities are due, of course, to transportation difficulties).

A new production record was set for normal superphosphate in January when 762,551 tons (basis: 18% P_2O_5) were turned out. Although the heavy output allowed a slight increase in stocks, the carry-over at the end of the month was far short of the reserve ordinarily required for this time of year. In considering the stepped-up production of normal superphosphate in January, it should be noted that the output of concentrated superphosphate in January was not up to the production of preceeding months . . . in fact, it was the lowest of any month since July, 1946.

An increase of 6.5 percent in deliveries of potash is reported during the first five months of the current fertilizer year, by the American Potash Institute. The total was 358,643 tons K_2O. These deliveries are reported to be only slightly less than the rate required to meet the estimated supply of 898,000 tons for this year. In addition, 16,500 tons of potash

were expected to arrive from France sometime in May. Germany's potentialities as a potash supplier were beginning to be seen in March when it was reported that some 100,000 tons of 40 percent potash were available there for export.

Production of fertilizer nitrogen in the U. S. was in good stride for the first six months of the fertilizer year which saw 54 percent of the year's goal of 592,400 tons realized. Greatest production increases were seen in ammonium nitrate and nitrogen solutions. However, after adding imports and deducting exports and material loaned to the Army, net supply for domestic agriculture was only 2 percent greater than during the first half of 1945-46. Because of the delayed arrivals of Chilean nitrate and the Army's taking much of the solid ammonium nitrate, availability of solid materials was actually 5 percent less than consumption in the first six months of the preceding year. Larger supplies of nitrogen solutions have permitted the manufacture of record quantities of mixed fertilizers, but many calls for solid nitrogenates for direct application have remained unsatisfied. What effect will be felt in the industry because of the Texas City explosion of an ammonium nitrate ship, was not possible to ascertain at press time. Industry spokesmen indicated that it was "too early" to make any statement.

Barring further work stoppages, output of ammonium sulfate and ammonium nitrate should now continue at a high level. Byproduct ammonium sulfate turned out in January amounted to 68,045 tons as compared with 43,523 tons in January a year ago. Synthetic ammonium sulfate production was almost identical with the same month a year ago.

Despite improvement in imports of Chilean nitrate noted in January, arrivals were still at a low level. (79 percent less than in January, 1946). However, the Maritime Commission's ships which were assigned for this purpose are expected to bring some 550,000 tons of Chilean nitrate into this country by June. This figure is 93 percent of the quota.

Borer Loss 28 Million in '46

European corn borer caused losses estimated at $28,740,789 to corn harvested for grain and to sweet corn in 1946, it was found in a U. S. Department of Agriculture survey of 446 counties in 22 states. The survey, conducted by the Bureau of Entomology and Plant Quarantine with the cooperation of various state agencies, was made in the late summer and fall of 1946. The estimated loss is believed to be conservative inasmuch as only about half of the counties known to be infested in the 22 states were surveyed. The figures include probably 90 percent of the total loss, however, the surveyors indicate.

Four states were hardest hit by the corn borer. These were Iowa, Illinois, Indiana and Pennsylvania in which 84 percent of the total loss occurred. Despite the heavy damage, the aggregate was less than the 1945 destruction in all states except Iowa, Minnesota and N. Carolina. Because of this decrease, the estimated loss in 1946 was 22 percent less than the year before, even though the crop values were higher, the acreage surveyed was larger, and the borer populations greater in three states.

•

Potash Rules Liberalized

Liberalization of regulations which had restricted prospecting for potassium on the public domain, was recently announced by the U. S. Department of the Interior. The fertilizer industry had long advocated such a move, maintaining that added supplies could be made available through locating new deposits.

Under the new rules, permits may be obtained to prospect on as much as 25,600 acres of the public domain in addition to 15,360 acres which may be leased. Heretofore, the Government had claimed one quarter of the production, but now it will reserve the right to purchase only one tenth of production.

Another important point in the new setup is that detailed information from applicants as to the process of mining and production, is no longer required as has been the case in the past.

Comments....

By Dr. Alvin J. Cox

This column by Dr. Cox appears as a regular feature of AGRICULTURAL CHEMICALS. Dr. Cox formerly was successively Physical Chemist, Chief Chemist, Assistant Director, and Director of the Bureau of Science, Government of the Philippines. He was appointed Chief, Bureau of Chemistry, California State Dept. Agriculture in 1932, retiring in 1945.

GONE are the days when a person with an active mind, with little or no equipment or assistance can carry out highly significant, successful experiments. Formerly when new products were put on the market, it was done with a hope and a prayer. Under modern conditions very few discoveries are made by unskilled persons. No longer are there many so-called secret formulas.

Most of the chemicals for agricultural use recently introduced have been developed by collaborative hard work and cooperation of interested persons and agencies rather than by some vague intuition. The wartime scarcity of many standard insecticides, acted as a spur to start governmental departments, universities, experiment stations, agricultural commissioners and executives, in the direction of producing new and promising economic poisons. The developments which came as the result amount to the greatest number in history. Entomologists, chemists, plant pathologists and physiologists, horticulturalists, and other investigators and public officials have worked with each other and with the industry, and have exchanged information. State law administration officials are more and more adopting an increasingly useful attitude. University staff members and those of other investigational institutions will look at and try reasonable new products.

Investigations require careful planning and experimentation. Otherwise they may end in a manner similar to the oft repeated mythical stories of "magic discoveries" such as that of mixing a solution of a chemical in the drinking water or with the food of poultry to "rid fowls of lice, mites and other external parasites" by exudation through the pores. The prices set for many such products were very high, as the producer believed that in such a manner a prospective purchaser would be convinced of the value of the products. However, not one of such preparations coming to my attention, had any effect on the enumerated parasites, if applied at the recommended strength.

This brings to mind a practically worthless plant extract that was once marketed. When a prospective purchaser noticed that the label showed only "Active ingredient (solvent) ½%" the vendor exclaimed, "But look at the '*eye-nerts*' 99½%, those are what do the job." The interested person was persuaded to buy the material on the promise that if he would pour it around the roots of his plants the insects thereon would be killed or leave and never return. But upon using the material there was no abatement, and the purchaser reported that the insects were as numerous as before.

The pioneering executive needs the help of inventive men trained along scientific and cooperative lines, in order to meet his many and new problems. Constructive thinking, unselfishness, trustworthiness and mutual cooperation make up an ideal team for accomplishment.

Unfortunately, selfishness is still prevalent, and some researchers seem to restrict their activity to studies that will primarily help themselves. Many brilliant, useful discoveries have not been remunerative to the discoverer, but the world needs the greatest possible amount of information. Selfish demands and untrustworthiness seldom lead to the happiness of anyone, and may indeed be a detriment to progress. No two people are alike, they cannot be made over, and one would not wish many of them to be done over. We can learn to accept people as they are and cooperate in their best qualities, which is not difficult when there is patience on both sides. Jobs can be done the hard way, or one can get fun out of his work. There is always room for constructive thinking, which should at all times be encouraged.★★

State Laws Obeyed

Checking on samples of insecticides and fungicides sold in New York state, to determine their compliance with state statutory requirements, chemists at the Geneva, N. Y., agricultural experiment station have reached the conclusion that manufacturers are doing a good job of placing quality products on the market.

During 1945, says the station's latest annual report, 217 samples of insecticides and fungicides were inspected and analyzed. Fourteen percent of the samples did not meet the manufacturer's guarantee, but only 3 percent of the total samples received could be considered serious violations of the Agriculture and Markets law, says the report, which continues:

"It appeared that the average quality of materials received and tested in 1945 was somewhat better than in previous years. Although fewer materials for processing were available, it seems that the manufacturers are succeeding in placing quality products on the market."

Technical Briefs

DDT to Protect Elms

Based upon the results of tests in 1946, the U. S. Department of Agriculture announces that DDT sprays offer the most promising means of protection against Dutch elm disease. Living and healthy elm trees can be protected from infection by two sprayings each season, the Department says, the first with a 2 percent DDT spray, followed by a 1 percent spray approximately 75 days later. By using an oil-DDT spray, dead and dying elms can be rendered relatively harmless as sources of infection.

Dutch elm disease is caused by a fungus which is carried to healthy trees principally by the Scolytus beetle known as the smaller European elm bark beetle. The native elm bark beetle can carry the disease, but is not so important a cause of infection. DDT acts not on the fungus, but by killing the beetles.

•

DDT Affects Young Fish

Young common and hardy fish of Rhodesia, were all killed within 24 hours by 1 part of DDT in 18 million parts of water, or 1 ounce of pure DDT per acre of surface. With 0.5 ounce per acre 80 per cent died in 1 day and the rest within the next 2 days; with 0.25 ounce per acre all were dead within 4-5 days. The DDT was applied in kerosene solution. A few similar experiments suggested that gammexane powder was also toxic. It is concluded that DDT applications against mosquito larvae should be made only with great caution in waters which are fish-breeding grounds. D. P. Pielou. *Nature 158*, 378.

•

Corn Borer Control

Nicotine bentonite diluted with pyrophyllite was as effective with 4 per cent nicotine as 7 per cent dual-fixed nicotine diluted with clay. Rhothane, Rohm & Haas product 761, Methoxy DDT, and Com. Solvents Corp. product CS431, were less effective than DDT. N. Turner. Conn. Agr. Expt. Sta., Bull. 495, 43 pp.

•

Cattle Lice Control

Dusting was the best method of controlling cattle lice. Dusts containing 10 per cent or more of derris or cube containing 0.5 per cent of actual rotenone, controlled all species of cattle lice. At least 3 ounces had to be applied per heifer or cow. Finely ground sabadilla seed could be substituted for rotenone. Nicotine was ineffective. Lethane 60, Lethane B71, Thanite, Velsicol, Phenothioxin, Dow K 1875, and pyrethrum were toxic to cattle lice but they could not be relied on for complete control. Hellebore was low in toxicity. DDT was fairly effective but not as effective as rotenone or sabadilla in dusts. Cattle-fly sprays were ineffective. The aerosol method of applying the insecticide was ineffective. Spot dusting as a method of evaluating louse powders was not accurate nor does it indicate the residual action of the insecticides. A laboratory method of evaluating the toxicity of insecticides to *B. bovis* is described which is quick and accurate. J. G. Matthysse. N. Y. Agr. Expt. Sta., Bull. 832, 67 pp.

Wireworm Identification Book

A bulletin to help in the identification of *Larval Elateridae* (Wireworm) found in Kentucky has recently been published by the Kentucky Agricultural Experiment Station, Lexington, Ky. The booklet presents a complete list of identifying characteristics of wireworms, which differ widely in form and size; also presented are descriptions of some 25 species, explaining the physical characteristics of the insect, average dimensions of segments, heads, etc., and the normal habitat of the worms. Methods of rearing wireworms for investigation and study are described in detail by the author, H. H. Jewett, who has made a study of the subject over a period of years. Fifteen pages of drawings illustrating portions of the anatomy are offered to aid in identification.

•

Benzene Hexachloride in Soil

Benzene hexachloride in a form suitable for use in controlling wireworms is being offered member-patrons of Cooperative G. L. F. Exchange, Ithaca, N. Y., this spring. On request, the co-op announced, the benzene hexachloride will be mixed with fertilizer in the organization's factories, this being recommended in order to spread the material evenly over the ground and get it incorporated in the soil to a depth of two to three inches. Cost should not exceed $10 per acre and may be less, farmers are told.

U. S. D. A. DDT Recommendations Given

INFORMATION on the uses of various DDT formulations for the control of insects affecting animals was distributed late in March by the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, USDA. Five types of DDT formulations are employed in the control of animal pests —dusts, wettable powders, emulsions, oil solutions, and aerosols. Technical DDT having a setting point of 89° C. is generally used for all formulations, except for certain types of aerosol preparations. For liquefied-gas aerosols, a product having a melting point not less than 103° C. is used.

Most of the experimental work with DDT dusts was done with mixtures containing pyrophyllite or non-fibrous talc. Materials to be avoided are those that are too fluffy or are liable to pack in the duster. Dusts are recommended in concentrations up to 10 percent for use on animals (except cats) infested with certain lice and fleas. Dusts are considered especially desirable for louse control on cattle and hogs in cold climates. Where dusts can be employed effectively and safely, their use is encouraged.

Wettable powders consist of finely ground DDT plus an inert carrier or diluent such as prophyllite or non-fibrous talc to which a wetting agent is added.

DDT emulsion concentrates contain DDT, an organic solvent, and a water-miscible emulsifier. The concentrate is diluted with water to obtain the desired strength of DDT for application as a residual-type surface spray or for use on animals as a spray or dip. Many solvents used in making such emulsions are of such a nature that they should not be applied directly to animals. It is recommended that high-boiling aromatic solvents be avoided.

Unstable emulsions are liable to occur with hard or highly alkaline waters. The heavier-than-water type of solvents are better for dips and the lighter-than-water types are more advantageous for spray-use. The total amount of spray applied to an animal should be considered. Too much emphasis has been given to concentration of DDT in the spray without due consideration to the amount of liquid and the actual amount of DDT applied. In most cases, the preferred treatment for pest control on livestock is the use of DDT wettable powders. For use as sprays by the average farmer or small livestock raiser, emulsions may offer certain advantages over wettable powders. They may also be more suitable than a wettable powder for use in the home.

The most desirable emulsion from the standpoint of safety is one in which the oil phase remains as a milky suspension for more than 24 hours. Wettable powders and emulsions of the heavier-than-water type may be used for several months in dipping vats.

An emulsion of 1 per cent DDT in the final dilution has also been recommended for the control of lice and crab lice on man.

For residual sprays and space applications, a petroleum distillate is recommended as a base for DDT when it is used around the home and barn without direct application to animals. As an additive to quick killing animal sprays of pyrethrum or certain thiocyanate compounds, DDT in concentrations up to 0.5 per cent is recommended.

When such a spray with 0.5 per cent DDT is used on livestock, it should be employed as a mist spray rather than wetting the skin.

Aerosol sprays are not considered an economical or effective means of applying residual deposits of DDT. Tests with DDT containing aerosols have suggested that they may reduce the numbers of flies in barns or similar locations but the effect is usually temporary. Certain of the fog generator types of machines can be adjusted to produce a rather wide range of particle sizes and under certain conditions are reported to deposit sufficient DDT to give a considerable lasting effect.

Soil Action vs DDT

A study of the influence of different soils on the insecticidal action of technical DDT against the larvae of the Japanese beetle was begun in 1943 by the Bureau of Ento-

mology and Plant Quarantine, U.S. D.A. Although the investigation is still in progress, the results obtained by the fall of 1946 are reported by Walter E. Fleming and Warren W. Maines of the Division of Fruit Insect Investigations.

In preliminary laboratory studies, DDT was applied as a 10 percent dust at rates equivalent to 25 to 50 pounds per acre to 28 soils, including 21 series and 6 types, from 6 physiographic soil divisions. Results are summarized as follows:

1. The speed of insecticidal action was faster in the sands than in the other types of soil, but there was no significant difference in the rates in the gravelly loams, shale loams, sandy loams, silt loams, and loams.

2. The origin of the soil did not seem to be an important factor. Equally as good results were obtained in soils from the Glacial drift areas, the Appalachian Mountains, the Piedmont Plateau, the Limestone Valley, and the Coastal Plain.

3. The speed of insecticidal action may be inhibited in poorly drained inadequately aerated soils. This retardation is probably associated with the higher content of organic matter in these soils.

4. The insecticidal action was the most rapid in the thoroughly leached and alluviated soils. It was somewhat retarded in soils rich in iron, aluminum, potassium, sodium, calcium, and magnesium, but the role each of these minerals has in inhibiting the action is not known.

5. No correlation was found between the effectiveness of DDT and the period the material had been in the soil. So far as could be determined, the effectiveness of DDT against the third-instar larvae did not change significantly during 1 2 8 weeks in the 28 soils used in this study.

In the field studies DDT was applied at rates ranging from 10 to 55 pounds per acre to soils of the Sassafras, Merrimac, Lakewood and Wethersfield series. All the treatments were applied in the spring with the object of poisoning the brood which would hatch during the summer. The DDT was applied to established turf and in commercial nurseries to eradicate the larvae in the soil about the roots of nursery stock. The results may be summarized as follows:

1. A 10-percent DDT dust applied to the surface of established turf at the rate of 25 pounds of DDT per acre caused a significant reduction in the larval population then in the soil and reduced the density of three subsequent annual broods to negligible proportions.

2. When DDT was applied as a 10-percent dust or as a spray to nursery beds and plots at the rate of 25 pounds of DDT per acre and mixed by cultivation with the upper 3 to 4 inches of soil, two subsequent annual broods were completely eliminated by mid-September.

•

DDT Phytoxicity

In a bulletin (E-715) on the phytotoxicity of DDT dusts and sprays to truck crops in Wisconsin, J. E. Dudley of the Division of Truck Crop and Garden Insect Investigations, U.S.D.A., describes the results of studies made during the summers of 1944, 45, and 46. In summary, he states that DDT dust mixtures and, in one experiment, DDT sprays were applied to 56 or more horticultural varieties of truck crops in small field plots by means of hand dusters and sprayers.

Definite foliage injury occurred on several varieties of cucumber and the following varieties of squash: Crookneck summer, Straightneck summer, Table Queen (Acorn), Buttercup, and Warted Hubbard.

Results of the experiment did not indicate that high temperatures contributed to DDT foliage injury. Rain, on the other hand, appeared to be associated with injury from DDT. The greatest amount of injury was recorded in the year having the highest rainfall during or closely following the applications, while only slight injury, to one crop, occurred in the year having a very light rainfall during or closely following applications.

•

Codling Moth Bulletin

A bulletin describing methods of codling moth control has recently been issued by the University of Illinois experiment station, in cooperation with the Illinois Natural History Survey. The booklet, designated as bulletin #519, is written by S. C. Chandler, field entomologist. Conclusions are based on a three-year study of the insect in Illinois.

The author states that lessons to be gained from this study could be that a grower who tries to control codling moth will find certain conditions or practices offsetting other conditions or practices in whole or in part. Thus one who follows certain good practices may safely give less attention and thereby save time, money, or labor, or accomplish other desired purposes. But the reverse is also true: a grower who neglects some practice may get poor control despite his careful adherence to other good and well-established practices. The relative importance of some of these compensating factors will be seen in the table below.

SOME SIGNIFICANT FACTS ABOUT CONTROL METHODS USED IN TWO GROUPS OF ORCHARDS: 1942, 1943, AND 1944

Factor	Four LEAST INFECTED orchards (carryover low in all)	Four MOST HEAVILY infested orchards (carryover low in all)
1. Spray material	Lead in 2 orchards, nicotine in 2	Lead in 2 orchards, combination in 2
2. Second-brood spray schedule	Short in 2 orchards, long in 2	Short in 2 orchards, long in 2
3. Number of applications ...	5, 9, 11, 12 (3-year overages for Orchards 1 to 4)	9, 8, 7, 2 (3-year averages for Orchards 10 to 13)
4. Gallons per tree	12, 12, 9, 22 (3-year averages for Orchards 1 to 4)	6, 7, 6, 8 (3-year averages for Orchards 10 to 13)
5. Spray methods	Very thoro in all	Not so thoro
	Nonstop in 1 orchard, stop at tree in 3 orchards	Nonstop in 1 orchard, stop at tree in 3 orchards
	Power take-off in 1 orchard, horse-drawn in 3 orchards	Power take-off in 2 orchards, horse-drawn in 2 orchards
	Owner-sprayed in 2 orchards, 2 not owner-sprayed	Owner-sprayed in 2 orchards, 2 not owner-sprayed
	Tower used in 1 orchard, not used in 3 orchards	Tower used in 2 orchards, not used in 2 orchards
6. Pruning	Trees pruned and opened up in all orchards	Trees not pruned enough nor opened up enough
7. Equipment	Good, and enough for acreage	Not enough, and quality too low except in 1 orchard
8. Sanitation	Good in all 4 orchards	Omitted entirely in 2 orchards, poorly done in 2 orchards

Phytotoxicity of DDT

The results of three years of experiments to determine the phytotoxicity of DDT dusts and sprays to truck crops in Wisconsin, are reported in U.S.D.A. bulletin E-715, by J. E. Dudley, Jr. of the Division of Truck Crop and Garden Insect Investigations. His summary of the experiments are as follows:

"During the summers of 1944, 1945, and 1946, DDT dust mixtures and, in one experiment, DDT sprays were applied to 56 or more horticultural varieties of truck crops in small field plots by means of hand dusters and sprayers.

"Definite foliage injury occurred on several varieties of cucumber and the following varieties of squash: Crookneck summer, Straightneck summer, Table Queen (Acorn), Buttercup, and Warted Hubbard. No injury traceable to the application of DDT could be discerned on any other crop.

"Results of the experiment did not indicate that high temperatures contributed to DDT foliage injury. Rain, on the other hand, appeared to be associated with injury from DDT. The greatest amount of injury was recorded in the year having the highest rainfall during or closely following the applications, while only slight injury, to one crop, occurred in the year having a very light rainfall during or closely following applications."

•

Control of Cattle Grubs

DDT is not effective to control the cattle grubs, *Hypoderma lineatum* and *H. bovis*. Rotenone sprays applied by means of power sprayers in four treatments in February, March, April, and May are recommended. H. B. Mills, H. Marsh, and F. S. Willson. Montana Agr. Expt. Sta. Bull. 437, 16 pp.

•

Control of Corn Worms

Liquefied gas aerosols containing 5 percent of DDT, 50 percent of methyl chloride, 10 of Velsicol "AR-60," and 35 of acetone were applied to sweet corn to protect the ears from attack by *Heliothis armigera, Pyrausta nubilalis,* and *Laphygma frugiperda.* The first and second were not controlled but populations of the third were greatly reduced. The latter species is a limiting factor in fall sweet-corn production in Maryland. L. P. Ditman, *J. Econ. Entomol.* 39, 668 (1946).

•

Grasshopper Control

A dust containing 8 per cent of *gamma*-hexachlorocyclohexane applied at 10 pounds per acre gave good control of grasshoppers in alfalfa. Dusts containing a lower percentage of the agent yielded proportionally lower results. A wettable dust containing 5 per cent of the agent appeared to be twice as toxic as a technical concentrate containing 10 per cent of active agent diluted with talc. After 24 hours all grasshoppers affected by the agent were either dead or had recovered. Velsicol "1068" in a dust containing 10 per cent of the technical material killed only about 7.7 per cent of the dusted grasshoppers. Insects other than grasshoppers killed in the plots dusted with cyclohexane derivative include beetles (5 species), camel crickets, red harvester ants, lepidoterous larvae (2 species), and flies. C. H. Brett and W. C. Rhoades. *J. Econ. Entomol.* 39, 677-8.

•

Improving Herbicidal Action

The amount of herbicide required to kill weeds may be considerably reduced if glycerine is used as a supplementary solvent, according to H. Hopp and P. J. Linder of the U. S. Department of Agriculture, Beltsville, Md. In their report in the *American Journal of Botany* (33:598, 1946), they describe work in which the herbicidal action of sodium arsenate, ammonium carbamate, sodium trichlorophenoxyacetate and sodium pentachlorophenoxy acetate was tested at high and low atmospheric humidity; *Coleus* and *Cuphea* being used as the test plants. Results indicated that a high water tension inside the plant resulting from low humidity promoted the effectiveness of herbicides. However, at low humidity the herbicides dried rapidly on the surface of the leaves and absorption was decreased.

The addition of glycerine to the solution increased the effectiveness of the herbicide at low humidity. It is suggested that glycerine probably acts by keeping the chemicals in solution for absorption into the leaves over an extended period. The addition of glycerine as a supplementary solvent reduced the amount of herbicide required for killing harmful and undesirable plants over that required in simple water solution.

•

"Rhothane" For Farm Pests

Commercial production of "Rhothane" (dichloro diphenyl dichloroethane) has been announced by Rohm & Haas Company, Philadelphia. Use of the new material in the control of agricultural pests is reported to have given good results with leaf hoppers, flea beetles, Colorado potato beetles, Japanese beetles, cabbage loopers and cabbage worms. The manufacturers say that the new material possesses toxicity comparable to DDT on insects, but is much safer to human beings, household pets, and farm animals.

The material has been investigated and tested thoroughly for the past three years in Texas, Oregon, Pennsylvania, California, New Jersey, New York, and Florida, according to the makers. Residual properties are similar to DDT, and in addition to controlling the same insects, "Rhothane" is said to be more deadly than DDT to mosquito larvae and the corn earworm.

•

Liquid Fertilizer Tested

The New Jersey Agricultural Experiment Station, New Brunswick, N. J. tells in Bulletin #694 of results obtained in vegetable growth through use of fertilizer in water. The authors are V. A. Tiedjens and L. G. Schermerhorn of the Station.

Results of these investigations during the past 10 years indicate that many vegetable crops can be grown more efficiently by the application of fertilizer in water than by the use of dry fertilizer. Yields of tomatoes, sweet potatoes, lima beans, snap beans, sweet corn, celery and peppers were

increased by the use of liquid fertilizers as starter solutions for setting plants and sowing seeds. Starter solutions in higher concentrations were used successfully for growing short-season crops to maturity.

Further applications of side-dressings of fertilizers in water to long-season crops like tomatoes, sweet potatoes, and celery were more efficient, in general, than the use of dry fertilizers. The results suggest that the application of fertilizers in water may lower the unit cost of growing vegetables by reducing the cost of supplying needed plant nutrients.

The hypothesis is advanced that the efficiency of fertilizer in water is due to at least two factors: first, greater availability of phosphoric acid, and second, reduction of injury caused by dry fertilizer.

•

DDT for Citrus Pests

The Bureau of Pest Control of the California Fruit Growers' Exchange has issued a warning to its members regarding use of DDT under certain conditions. The notice says:

While DDT has proven very effective for citricola scale and citrus thrips control this past year in central California, unfortunately, by killing Vedalia ladybird beetles, it has at the same time permitted cottony cushion scale to increase generally and in some groves in an alarming way. Serious infestations have been confined largely to groves treated with DDT liquid applications made during the period April to July. Therefore, growers are urged to use DDT cautiously, applying not over one spray treatment within a season and paying particular attention to the time of its use. In view of the threat of cottony cushion scale, particularly folowing spray applications of DDT, it is recommended that DDT not be applied as a spray from April 1 to midsummer since this is the period when the most effective work of Vedalia beetles may be expected. DDT as a dust has appeared much less likely to develop a cottony cushion scale problem than as a spray. In no case should DDT be applied where cottony cushion scale can be found at all prevalent in a grove. At the present time it is suggested that formerly used treatments be used if feasible instead of DDT.

Blossom growth is now well advanced and time for applying petal fall treatments will likely come the last of April or first of May. If a dust program is used, dust with sulfur or 2% DDT-sulfur at the time the petals are largely dropped, using 100 pounds per acre. Two percent lime sulfur if used should be applied during the latter part of the bloom and not after the fruit is pea sized because of the likelihood of "scratching" injury. Tartar emetic in areas where effective, or nicotine bait sprays, may also be used for thrips control as the petals fall.

•

Elm Disease Control

Concentrated DDT solutions are being used in Englewood, N. J., against Scolytus beetles carrying the virus of Dutch elm disease. About 3,500 trees were treated. Machines used in the operation were made by Accurate Tool Co., Newark, N. J., and the Lawrence Aero-Mist Co., Greenfield, Mass.

Suppliers' Bulletins

"Het-75" Booklet Available

Michigan Chemical Corp., St. Louis, Mich., has announced production of a new insecticide to be called "HET-75." It is described as a non-oily formula of hexaethyl tetraphosphate. In tests it has given excellent control of cabbage aphid, greenhouse aphids, red mites and other pests, according to the company. The product contains 75 percent of the active ingredient together with wetting and spreading agents. "HET-75" will supplement the company's line of DDT insecticides. A bulletin describing the product is available upon request.

•

Powell Announces "HETP"

A technical bulletin on hexaethyl tetraphosphate has been issued by John Powell & Co., New York, announcing that Powell is now producing the product under the trade name of "HETP." The bulletin describes the material, gives its history and chemical structure, chemical and physical properties, toxicity, compatibility, and insecticidal action. A listing of its uses is given, recounting a number of successful applications in various parts of the country.

•

Tomato Blight Pamphlet

Chipman Chemical Co., Bound Brook, N. J. has issued a pamphlet on control of tomato blight through use of its product, "Copper Hydro." Facts are presented concerning loss from the 1946 late blight, and instruction is given on the use of copper in controlling the disease.

•

U. S. Rubber Booklet

"Pest Control Simplified" is the name of a new booklet published by Naugatuck Chemical Division of U. S. Rubber Co. The 18-page brochure discusses plant diseases, describes the action of fungicides and seed treatment materials, and suggests proper materials for control of agricultural insect pests. Recommended spray schedules are listed, with information covering proper dosages.

•

Chipman Livestock Folder

A new folder on Chipman Livestock Insecticides has been issued by the Chipman Chemical Co., Bound Brook, N. J. The circular covers methods of control for cattle grubs, lice and ticks, sheep ticks and lice, chicken lice, and various fly pests and the Chipman products for their control and means of use. Illustrated seasonal history of heel fly development is shown. Chipman products listed include DDT spray powder and dusts, Berako liquid and spray powder, Cubor dusts, and Atlas Cattle Dip. Copies of the circular are available to the trade from the Chipman offices at Bound Brook, N. J.

•

Hooker Issues Catalog

Hooker Electrochemical Co., Niagara Falls, N. Y., has issued a new general products bulletin, comprising some 20 pages of description, physical and chemical properties, formulas, uses and shipping instructions of its products. A number of new products are included in the list. Copies of the booklet are available, according to the company.

New Pest Control Guide

Grasselli Chemicals Department of E. I. duPont de Nemours & Co., Wilmington, has issued a "Pest Control Guide" for use of commercial growers, agricultural agents, educators, and others. The booklet pictures many insect pests, shows examples of plant diseases and presents photos of many weeds susceptible to 2, 4-D. A comprehensive chart is given, showing the compatibility of spraying and dusting materials commonly used in pest control for agriculture. A list of du Pont trade-named products is given, along with uses, recommendations, and a brief description of the properties of each.

•

New Mosquito Killer

Ampion Corporation, Long Island City, N. Y., has placed on the market an insecticide, "Mosquitrol" for out-of-door application to control mosquitoes and gnats. According to the makers, the material has been tested in a number of areas with satisfactory results. Its residue remains effective up to three weeks, the makers say, and the material is said to be harmless to bees, plants and humans.

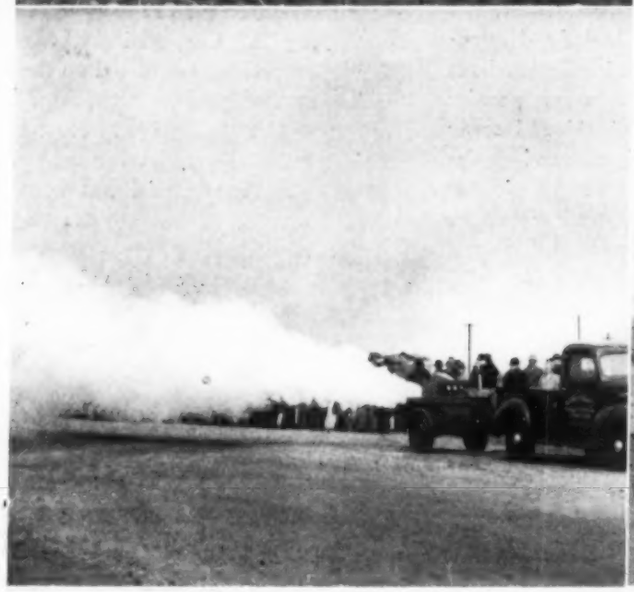
•

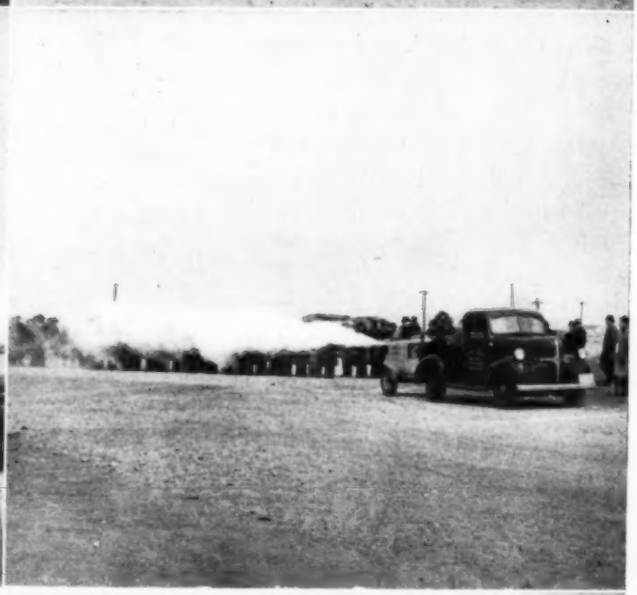
"Gesarol" in 1 Gal. Cans

Departing from its former policy of selling "Gesarol E 25" only in 55 gallon drums, the Geigy Co., Inc., New York announces that the product is now being packed in 1 gallon cans. The product is an emulsifiable DDT composition.

Faesy & Besthoff in New Long Island Location

Faesy & Besthoff, Inc., New York, have announced the opening of a new warehouse and plant at Hicksville, L. I. The announcement is made in connection with observances of the firm's 25th anniversary. The new facilities include some 40,000 square feet of floor space, served by a direct railway siding and truck loading and unloading platforms. The company has also instituted a special department for repacking into small containers materials formerly available only in bulk.





An exhibition of spray application equipment featured the New Jersey Mosquito Extermination Association's annual meeting at Atlantic City in April. Above are seen some of the machines performing before observers. Included in the demonstrations were fog machines, a number of blower types, and one airplane sprayer.

INDUSTRY NEWS

Pacific Slope AAEE Meeting

The 31st Annual meeting of the Pacific Slope Branch of the American Association of Economic Entomologists is scheduled to be held at Hotel Claremont, Berkeley, California for three days beginning June 23. According to secretary Roy E. Campbell, about 50 papers will be presented at the meeting, and symposiums will be held on "New Insecticides" and another on "The Effect of Insecticides on Beneficial Insects."

•

NAIDM Meets in June

The 33rd mid-year meeting of the National Association of Insecticide and Disinfectant Manufacturers is scheduled to be held in Chicago's Edgewater Beach Hotel, June 9, 10 and 11. Topics to be discussed include "Current Legislation," by W. J. Zick of B. Heller & Co., Chicago; "A Fly Control Program," by Dr. Harold Gunderson, Iowa State Extension Entomologist; "What's Ahead in Insecticides?" by S. A. Rohwer, B. E. P. Q., Washington; "Technical and Commercial Aspects of 2, 4-D," by Dr. L. W. Kephart, in charge of weed investigations, U. S. D. A., Beltsville, Md.; and "Newer Synthetic Insecticides," by E. F. Knipling, B. E. P. Q., Washington.

•

Sprayer Corp. Moves

Sprayer Corporation of America announces its new location at 1712 Payne St., Evanston, Ill. The former location was in Chicago. The company expects to expand its production of electric sprayers for applying liquid insecticides, and will continue manufacture of motorized units for compression and fan-type spraying.

•

Haller to USDA Position

Dr. H. L. Haller, authority in the field of organic chemistry, has been appointed special assistant to Dr. P. N. Annand, Chief of the Bureau of Entomology and Plant Quarantine, U. S. D. A. Dr. Haller has long been associated with research problems. He was one of three

DR. H. L. HALLER

men to determine the chemical structure of rotenone in 1932, and during World War II, he helped conduct a series of research studies in the chemistry of DDT and other insecticides for use in the form of sprays, aerosols and dusts. He and his associates at the B. E. P. Q. synthesized new chemical materials and converted them to maximum efficiency for military use. Dr. Haller is a graduate of the University of Cincinnati and of Columbia University, New York.

•

New Fertilizer Plant

Southern Acid and Sulphur Co., St. Louis, Mo., has announced plans for construction of a million dollar sulfuric acid plant in North Little Rock, Ark. The new plant, with a floor space of 300 by 500 feet, will manufacture materials for use in phosphate fertilizers. The new building will adjoin the firm's Arkansas Fertilizer Co. division, which produces superphosphate and mixed fertilizers for consumption in Arkansas and adjoining states. President of the firm is Joseph Mullen.

•

Florida Group Meets

The Florida Agricultural Research Institute held its annual meeting at the Orange Court Hotel, Orlando, Florida, April 16 and 17. Speakers from Florida experiment stations discussed many phases of the insecticide, fungicide and fertilizer fields, with a number of open forums and group talks. A banquet held on the evening of April 16 was attended by more than 250 men. Officers of the F. A. R. I. are Fred F. Coffee, Jacksonville, president; G. D. Sloan, and J. K. Sprakman, vice presidents; D. N. Barksdale, treasurer; and Frank L. Holland, Secretary-Manager.

•

Bussart to Velsicol Corp.

Velsicol Corporation, Chicago, announces the appointment of J. Everett Bussart, to its staff as an entomologist. Mr. Bussart was formerly connected with the California Spray Chemical Corporation.

Coming Meetings

Agricultural Chemicals wishes to publish the meeting date and place of any gathering concerned with manufacturing, distribution, application or discussion of chemicals for agricultural use. Information of such meetings is solicited.

National Association of Insecticide & Disinfectant Mfgrs. Edgewater Beach Hotel, Chicago, June 9, 10, 11.
American Plant Food Council June 13, 14, 15. Hot Springs, Va.
National Fertilizer Association June 19, 20, 21. Essex & Sussex Hotel, Spring Lake, N. J.
American Association of Economic Entomologists (Pacific Slope Branch) June 23, 24, 25, Berkeley, Calif.
Fertilizer Chemistry Division, A.C.S., Sept. 14, New York.
Pacific Chemical Exposition October 21-25, San Francisco.
American Association of Economic Entomologists (In conjunction with meeting of American Association for Advancement of Science, December 26-31, Congress Hotel, Chicago, Ill.
Exposition of Chemical Industries New York, December, 1947.

United Co-op Moves Office

United Cooperatives, Inc., Alliance, Ohio, has announced the removal of its Spray Material department from New York to Philadelphia. Address of the new location is 123 S. Broad Street, room 2126. Through the new office supplies of insecticides, fungicides, aerosols, diluents, etc., will be purchased for distribution through local cooperative farm supply organizations in Ohio, Indiana, Michigan, New York, Pennsylvania, Virginia, N. Carolina, Maine, Wisconsin, Georgia, Illinois, Minnesota, Utah and Washington.

•

Sheals With Aero Mist

Ralph Sheals has been elected president of the Lawrence Aero-Mist Sprayer Co., Inc., of Greenfield, Mass., according to a recent announcement by the company. Mr. Sheals was formerly connected with the Bureau of Entomology and Plant Quarantine of the U.S.D.A.

•

Insecticide Bill to Senate

Following Congressional hearings which began a month before, the Andresen bill (H.R. 1237) was approved by the House and passed to the Senate on May 12. At press time, industry observers expressed hope that the bill would be referred to a senate committee and that favorable action would be taken soon.

•

Pea Aphid Recommendations

Out of the Pea Aphid Control Conference held last month at Baltimore, came a number of recommendations regarding formulations of insecticides to be used against this pest. These included recommendations for DDT, rotenone and benzene hexachloride, as follows:

1. All applications are to be made with ground equipment.
2. *DDT*:
   (a) 40-50 lb. per acre of impregnated dust containing 1% DDT and 2-3% of a suitable non-volatile solvent.
   (b) 125 gal. per acre of emulsion spray made from concentrate containing 25-30% DDT to give approximately 0.5 lb. DDT per acre.
   (c) 10 lbs. per acre of liquefied gas aerosol containing 5% DDT and 50% propellant.
3. *Rotenone*
   (a) 40-50 lb. per acre of dust containing 1% rotenone from ground root with 2% mineral oil.
   (b) Spray 3 lb. of ground root containing 5% rotenone per 100 gal. water with wetting agent.
4. *Benzene hexachloride*—to be used experimentally. Dust containing 0.5 to 1.0% gamma isomer.

The conference, attended by representatives of industry and State entomologists, was held April 8 at the Lord Baltimore Hotel. Dr. Ernest N. Cory, Maryland State entomologist, and president of the American Association of Economic Entomologists, was chairman of the meeting.

Fertilizer Ass'ns. Meet in June

A. P. F. C. Plans Hot Springs Gathering June 13, 14, 15

Clifton A. Woodrum
President, American Plant Food Council, Washington, D. C.

HEADLINING a program which includes a number of other prominent men in the agricultural field, the Secretary of Agriculture, Clinton P. Anderson, is scheduled to speak at the American Plant Food Council convention at the Homestead Hotel, Hot Springs, Va., June 13, 14 and 15.

Clifton A. Woodrum, president of the American Plant Food Council announces that the program will include representatives of the agricultural press, soil scientists, and a member of the House Agricultural Committee. Speakers scheduled to appear included Rep. Harold D. Cooley (D-N.C.), member of the House Agricultural Committee and Dr. Firman E. Bear, chairman of the Soils Department, Agricultural Experiment Station at New Brunswick, who will be guest speakers on the June 13 program which also includes the annual address of the Council president.

An "Agricultural Editors' Breakfast Forum" with "A Long-Range Look at Agriculture" as the subject will be a feature of the morning program on June 14 with Dr. Paul D. Sanders, editor of "The Southern Planter," Richmond, Va., as moderator and Robert H. Reed, editor of the "Country Gentleman," Philadelphia; Ray Yarnell, editor of "Capper's Farmer," Topeka, Kans., and W. C. Lassetter, vice-president and editor, "The Progressive Farmer," Memphis, Tenn., as speakers.

Prof. Emil Truog, chairman of the Soils Department of the University of Wisconsin, Madison, will deliver the principal address on the morning program, June 14, followed by talks by Gus R. Douglass, Jr., Grimms Landing, W. Va., National President of the Future Farmers of America; Carl M. Orth, Route 6, Terre Haute, Ind., one of the winners in the National 4-H Club Field Crops Contest and William G. Carlin, R. D. 4, Coatesville, Pa., "Star Farmer of America," using as their theme, "Youth in Agriculture." Secretary Anderson will be the banquet speaker at the closing session of the Convention.

Hon. Clinton P. Anderson
U. S. Secretary of Agriculture

Secretary Anderson is a native of South Dakota, and a graduate of Dakota Wesleyan and the University of Michigan. He has been closely associated with agriculture for many years, and served on various House committees as well as in other important posts before becoming Secretary of Agriculture.

The convention committee in charge of the program is composed of J. A. Howell, of the Virginia-Carolina Chemical Corp., Richmond, Va.; George E. Petitt, Potash Company of America, New York; and W. T. Wright, of F. S. Royster Guano Company, Norfolk, Va. Mr. Wright is chairman of the group.

N. F. A.'s Annual Convention at Spring Lake, New Jersey

Maurice H. Lockwood
President, National Fertilizer Association, Washington, D. C.

THE Essex and Sussex Hotel, Spring Lake, N. J., will be the scene of the annual convention of the National Fertilizer Association meeting June 19, 20 and 21.

On June 19, first day of the meeting, the N. F. A. Board of Directors and various committees will hold sessions, and the following two days will be devoted to the general sessions of the convention, attended by association members. On the evening of June 20, the annual dinner is scheduled to be held.

Business of the convention, in addition to usual association matters will include the election of a number of directors to succeed those whose terms will expire at this time. Arrangements are also being made for a golf tournament and bridge for wives of convention registrants.

According to Maurice H. Lockwood, president of the N.F.A., speakers scheduled include Weller Noble of Pacific Guano Co., Berkeley, Calif.; Dr. W. H. Martin, Dean of the New Jersey Agricultural Experiment Station, New Brunswick, N. J.; Glenn A. Cumings, U. S. Department of Agriculture, Washington; Dr. Jackson B. Hester, soil technologist, Campbell Soup Co., and Prof. C. J. Chapman of the Department of Soils, Wisconsin University.

Apply like whitewash

For Dairy Barns, Poultry and Hog Houses, Sheds, Dog Kennels, Storage Rooms, Basements, etc.

One coat of Tykor Insecticidal-White serves two purposes—(1) Imparts attractive and sanitary appearance and (2) provides long time killing action against flies, gnats, mites, mosquitoes, spiders, etc.

Simply mix with water and apply it with spray or brush. It covers metal, wood, stone, cement or cinder block—will not chip or flake off—contains no lime.

Economical—costs less than 30¢ per 100 square feet of surface area.

Other Tykor Insecticides for use by commercial sprayers

Tykor has an insecticide for every need...They are available in bulk and in convenient package form.

TYKOR SURFACE-SPACE INSECTICIDE
(Dual purpose—ready to use. Contains 100% active ingredients including 5% DDT)

TYKOR WETTABLE POWDER
(50% DDT Water-dispersible powder)

TYKOR RESIDUAL INSECTICIDE
(25% DDT Water-miscible concentrate)

TYKOR STOCK SPRAY
(Water-miscible concentrate containing DDT)

TYKOR

For further information, write to

TYKOR PRODUCTS INC.
350 Madison Avenue
New York 17, N. Y.

...Death-Dealing Fog For Insects

TIFA is the QUICK . . . SURE . . . ECONOMICAL method of insect pest control.

TIFA discharges newly developed as well as the older insecticides, fungicides, repellents or hormones in a *true fog* that *spreads quickly* over a wide area . . . *clings* to all objects in its path . . . *permeates* the smallest crevices.

TIFA . . . a compact, easily handled one-man unit, powered by a standard-make gasoline engine . . . can be used wherever insect pest control is essential . . . in houses, barns, pens, corrals, buildings . . . on crops and livestock . . . in forests, orchards and on open ranges. And it's BUILT TO LAST.

Write for illustrated folder on sensational TIFA—full details on how it operates, what it does, and official comments on its astonishing effectiveness.

TIFA **TODD INSECTICIDAL FOG APPLICATOR**

A Product of

COMBUSTION EQUIPMENT DIVISION
TODD SHIPYARDS CORPORATION
81-16 45th Avenue, Elmhurst, Queens, N. Y.

Matthysse to Baker Co.

Dr. John G. Matthysse has been appointed entomologist in the organic agricultural chemical development department of J. T. Baker Co., at Phillipsburg, N. J., it was recently announced. Dr. Matthysse is a graduate of Cornell University, and was at one time connected with the entomology department of the school. More recently, however, he was entomologist for the Geigy Co. in its Bayonne research laboratories.

•

Caution On HETP Use

A warning on the use of hexaethyl tetraphosphate has been issued by a subcommittee of the Interdepartmental Committee on Pest Control, U.S.D.A. The group stated that since the toxicity of hexaethyl tetraphosphate for humans and warm-blooded animals is not fully known, although recognized as a "very toxic and dangerous material," precautions such as the following are recommended:

1. Avoid contact with the skin, especially when handling the concentrated material. Gloves impervious to the material should be worn. If skin is accidentally contaminated, wash carefully with soap and water immediately. Keep shirt buttoned at neck and wrists.

2. Avoid the inhalation of hexaethyl tetraphosphate mist, dust or aerosol by wearing a respirator or mask approved by the U. S. Bureau of Mines.

3. Adequate personal hygiene and cleanliness of the operation is necessary. At the end of the operation, the clothing should be removed, followed by a thorough bath with warm water and soap.

4. Avoid contamination of food; smoking, eating and chewing tobacco should be prohibited in the operating areas.

5. Any persons developing symptoms of headache or tightness of the chest when using hexaethyl tetraphosphate should be removed from the exposure. In the case of ingestion of hexaethyl tetraphosphate, an emetic, such as mustard or warm soapy water, should be used immediately and the patient referred to a physician.

6. A dye should be added to the material in such a concentration that it will be readily detectable in the final insecticide solution.

The subcommittee which issued the precautionary measures for users of hexaethyl tetraphosphate is composed of Dr. Paul A. Neal, chairman, Chief, Industrial Hygiene Research Laboratory, National Institute of Health; Dr. A. J. Lehman, Chief, Division of Pharmacology, Food and Drug Administration; and Dr. L. E. Chadwick, Chief, Entomology section, Medical Division, Army Chemical Center, Edgewood Arsenal, Maryland. S. A. Rohwer, Assistant Chief of the Bureau of Entomology and Plant Quarantine, is chairman of the Interdepartmental Committee on Pest Control.

•

New Spray Announced

B. F. Goodrich Chemical Co., Cleveland, Ohio, has announced a new agricultural spray consisting of a mixture of "Good-Rite" p.e.p.s. (polyethylene polysulphide) and zinc-dimethyl dithiocarbamate and cyclohexylamine. The spray is used to thin excessive and undesirable fruit and is said to be non-injurious and non-caustic to both fruit and tree. This is said to permit the remaining fruit to attain larger size and improved quality.

Two Join Westvaco

Westvaco Chlorine Corp., New York, has announced that W. L. Sager has joined its Agricultural Chemicals Division to specialize in sales and service of the firm's fumigants, including grain and soil fumigant mixtures and methyl bromide. The company also announces that Charles H. Tidwell has likewise joined the Agricultural Chemicals division. Tidwell was formerly connected with the Shell Oil Co. and the Texas Game Commission in rodent and insect control operations. During the war he served with the U. S. Coast Guard. He will maintain offices at Orlando, Florida for the distribution of products in Alabama, Florida, Georgia, Mississippi and S. Carolina.

•

Liquid Fertilizer Sprayer

Descriptive literature on the "Gat Sprayer" for applying fertilizer to small areas with a garden hose, is available from McCormick & Company, Baltimore 2, Md. The sprayer consists of an inverted jar containing two pounds of a 13-26-13 fertilizer which is distributed when the jar lid is attached to a garden hose. As the water is directed through the small opening, the finely-ground fertilizer material is mixed with it and is applied to the ground in this fashion. The two pounds of fertilizer are said to cover about 800 square feet of garden or lawn.

•

Blending Bulletin Out

Sprout, Waldron & Co., Muncy, Pa. has issued a revised bulletin covering its equipment for the intimate blending of dust insecticides and similar fine powder formulas.

GUEST EDITORIAL

(*Continued from Page 17*)

are used in many of the vegetable growing areas of the State.

For several years before 1935, increasingly large applications of nitrogen, phosphorus, and potash on Florida's citrus groves seemed to result only in a decline of the trees, a decrease in yields and a lowering of fruit quality. Decades previous, citrus groves had remained thrifty on more fertile but colder soils, fertilized with barnyard manures and less refined commercial fertilizers. Through the use of rough lemon rather than sweet or sour orange root stocks, it was possible to plant in warmer but sandier locations. This resulted in greatly increased acreages, in the use of larger quantities of mineral fertilizers, and in a decline in yield after 5 or 6 years of satisfactory production.

By 1935 or before, researchers were satisfied that the trouble was not due to short-lived root stocks. Copper long had been the specific remedy for dieback, and zinc, manganese and magnesium deficiencies had been demonstrated in Florida's groves. Attempts at correction by using any one of these was generally unsuccessful, and often merely brought another deficiency into prominence. Intensive experimentation demonstrated that copper, zinc, manganese and magnesium, in addition to the usual fertilizers, were necessary to make the trees thrifty again; that copper, zinc and manganese could be applied as sprays. By 1937, it was very evident to the investigators that a program of control was entirely inadequate inasmuch as yields had decreased greatly by the time deficiency symptoms could be observed; and, that practically all soils in Florida planted to citrus were deficient in most of these elements. Intensive and extensive researches have developed 6-figure fertilizer mixtures, and integrated spraying programs which are almost universally used throughout Florida's citrus industry.

A number of minor elements have been shown to play major roles in the growth and production of citrus, vegetables, subtropical fruits, pastures, nut crops such as tung and pecans and certain farm crops and ornamentals, as well as livestock. These are copper, zinc, iron, manganese, magnesium, boron and cobalt. During 1943-44 there were used for all agricultural purposes in Florida over 18½ million pounds of copper sulfate, 3-1/3 million pounds of zinc sulfate, and almost 23 million pounds of manganese sulfate. This amount of manganese sulfate represented about 70 percent of all of that material in agricultural usage in the entire United States that year. Comparatively large quantities of the other elements are likewise being constantly used. Without the use of minor elements, the rapid progress in agricultural production in Florida could not have taken place. ★ ★

AIFA MEETING

(*Continued from Page 29*)

about 4; the other isomers of benzene hexachloride about the equivalent or

less; chlordane, about the equivalent; toxaphene, about 4.

"Studies on skin absorption in rabbits indicate that DDT in the solid form is not absorbed through the skin. Solutions of DDT are absorbed and local or systemic effects may be elicited. The gamma isomer of benzene hexachloride may be absorbed particularly from solutions. Systemic reactions have been noted at levels of 20 mg./kg. after two or more daily applications. Chlordane shows considerable toxicity on percutaneous application with 'Toxaphene' probably even more toxic.

"Very little is known regarding the absorption, distribution, and excretion of the chlorinated hydrocarbon insecticides. Published reports indicate that if the DDT intake is greater than 7 parts per million in food, appreciable storage in the fat can occur. Several times the acutely fatal dose may actually be stored. This stored DDT may be mobilized during starvation, and the characteristic signs of poisoning can develop in the starved animal. Appreciable amounts of DDT are excreted in the milk.

"The symptoms of poisoning following ingestion of any of the above halogenated derivatives are similar in most respects. There is an initial hyperexcitability which is followed by generalized tremors, convulsions, and, with fatal doses, coma and death. The alpha and delta isomers of benzene hexachloride appear to be central nervous system depressants.

"Hexaethyl tetraphosphate is extremely toxic. The average lethal dose for most animals is about 5 mg./kg. The material is rapidly absorbed through the skin, and as little as 1 mg./kg. can produce symptoms of poisoning. Comparisons with nicotine sulphate reveal that hexaethyl tetraphosphate may be about twice as toxic, but nicotine sulphate has the added advantage of not being absorbed through the intact skin.

"The health hazards involved in the use of chemical agents for the control of insects appear to parallel, in general, the effectiveness of the insecticide."

Mr. Rohwer mentioned some other materials coming on the market as synergists, or activators, and mentioned piperonyl butoxide, used to synergise pyrethrum. Dr. Lehman said "laboratory data indicate that under ordinary conditions of use the addition of these activators in concentrations as proposed does not materially increase the health hazards inherent to the original insecticide preparation."

A. I. F. A. President George F. Leonard of Tobacco By-Products and Chemical Corporation, Louisville, Ky., presided at all meetings of the group. George P. Lamb, Washington attorney, spoke to the group regarding certain legal matters, and was speaker of the evening at a banquet held Thursday night. Committee meetings occupied the major portion of Wednesday, and a golf tournament was held on Thursday. Supplementing his talk of the morning, Mr. Irons showed moving pictures of application equipment Thursday afternoon.

APPLICATION EQUIPMENT

(*Continued from Page 25*)

mately 40 feet was obtained, but the spray deposit extended considerably beyond. This was repeatedly measured at 60 to 80 feet wide. The range in droplet size was rather wide, with 52 percent of the droplets between 100 and 200 microns and 84 percent between 50 and 250 microns. The dispersion of spray particles deposited per square inch across the swath varied according to location and flight conditions from 0 to 682, but occurred most frequently in a range between 100 and 200 droplets per square inch.

Formulation of concentrate sprays for aerial treatment requires particular attention in order to reduce the evaporation of droplets. Much of the water suspension spray evaporated before contact with the plants.

It was soon realized that biological results from field treatments do not afford much opportunity for development and improvement of aerial dust and spray dispensers. New techniques are being worked out, however, which may be used for evaluation of equipment performance in the absence of crop and pest. With such methods studies may be carried on through much of the year. Considerable improvement is needed in the design of airplane dusters and sprayers. The dust pattern must be widened so as to reduce the high deposit in the center and the feed mechanism should be made more reliable for delivering dust at a uniform desired rate from the hopper. With the aerial spray, control of droplet size is needed not only from a practical application standpoint, but first to determine experimentally the most effective droplet size needed for the particular job.

Conditions and requirements vary greatly for the different insects and plant diseases to be controlled, consequently, equipment needs will differ widely. Certainly no one type of equipment or method will be generally accepted to the exclusion of the others. There is no evidence at present to indicate such a trend. The new types of applicators must compete with old established methods and machines which are also being improved. There can be no compromise with efficiency in control.★★

NEMATODES

(*Continued from Page 33*)

tation known to occur on the North American continent involves about 2,600 acres near Hicksville, New York. This area represents less than five percent of the land normally planted to potatoes on Long Island. Thus, an aggressive policy directed at prevention of spread is clearly indicated. Should the golden nematode become established elsewhere in New York, in Maine, the Red River Valley of Minnesota and North Dakota, the San Luis Valley of Colorado, the potato growing areas of California, Idaho, Nebraska, North Carolina, or elsewhere, the tax on growers would be tremendous. Potato growers of the United States must recognize the gravity of the situation and lend their full support to the current effort to prevent its further spread.

Before the golden nematode was

known to occur on Long Island potatoes from infested fields moved to market without restriction. Most of these undoubtedly were consumed in New York City or in other metropolitan areas. It is possible, however, that some may have found their way to rural points. Bags used in marketing potatoes from infested fields may have been sold to potato growers in areas some distance from Long Island. No doubt some local spread, yet undiscovered, has resulted from soil drift and from the use of farm machinery interchangeably on infested and non-infested fields.

In view of the above, and keeping in mind the possibility of a separate introduction from some foreign source, State Pest Control officials throughout the United States and Canada must be alert to the possibility that the golden nematode may already have become established in areas under their jurisdiction, either in home gardens or commercial fields. It is important to remember that infestation may exist in a field for several seasons as small spots or streaks before growers become conscious of appreciable damage. Therefore, any reports, suggestive of golden nematode damage, should receive prompt attention. ★ ★

EXPERIMENT STATIONS

(*Continued from Page* 39)

deposit can be obtained without wasting dust. But the spray duster liquid must contain a good spreader; a sticker is much less important and may even be harmful in summer applications. Adhesion of sulfur dusts is more affected by variations in the liquid-dust ratio than in the concentration of oil stickers in the liquid. A satisfactory ratio of 1 gal. liquid to 3 lbs. dust was found and the report advises that an even dust feed is essential.

In efforts to determine the maximum performance of the New York spray duster, potted greenhouse grown plants were used to establish the type and concentration of oil and emulsifier, amount of liquid, degree of atomization, pressure and the fungicides, insecticides and conditioning agents to be employed. Details of findings are outlined and the report adds that "It is considered that the spray-duster is especially adapted to apply the new organic insecticides and fungicides."

Report is made on findings from investigations to increase the resistance of plants to fungous infection by absorption of the toxicant into the host tissue and its translocation to other parts of the plant. Development of an adequate spray program for control of major diseases of hops is announced and significant new data is submitted on control of oat diseases due to seed-borne microorganisms.

IDAHO Station Report

IDAHO Experiment Station's report of 1946 activities includes a brief account of the use of blossom thinning sprays on apple trees which, it is asserted, demonstrate their value in correcting uneven bearing from year to year, as well as reducing the cost of fruit thinning.

Using "Elgetol 30" at the rate of 1 pint per 100 gallons of spray in a heavy-bearing crop year, blossom thinned Rome Beauty trees produced an average of 50 boxes of apples per tree, while hand-thinned trees produced only 40 boxes. In the following year trees that had been blossom-thinned with "Elgetol" produced 23 boxes per tree, while the hand-thinned trees averaged only 9 boxes per tree.

Idaho investigators at the Moscow station conducted experiments to determine if spraying sheep to control sheep and wool ticks had advantages over the older method of dipping the animals in various insecticides. Results obtained, says the report, show that DDT, used at the rate of 4 lbs. of 50 percent wettable DDT powder to 100 gallons spray, "is a very excellent insecticide for sheep tick and wood tick control on sheep."★★

LISTENING POST

(*Continued from Page* 41)

ready been killed by blue mold alone or in combination with cold. The cold weather made many growers afraid to remove extra tobacco bed coverings long enough to spray or dust regularly. The extra covering in the absence of mold control measures, creates ideal conditions for maximum disease damage. In a small percentage of plant beds most of the plants have already been killed by mold. However, few plants have been lost where beds were protected from cold and sprayed or dusted regularly.

SOUTH CAROLINA. An unusually late season in South Carolina has delayed plants generally from 3 to 4 weeks later than normal. A large percentage of growers were forced by cold weather in February to resow their beds, and late in March plants in the majority of beds were still very small. Blue mold first appeared shortly after the middle of February in one bed, during the second week in March in another. It has continued to spread during March with favorable moisture conditions, but slowly because of cold weather and lack of plants. By the third week in March it was general but scattered in distribution. Reliable reports indicate that many growers are using "Fermate" dust and are checking the disease effectively. At least 100 tons of "Fermate" dust have been distributed in South Carolina, and are now in the hands of growers who had the foresight to make early purchases. Requests for "Fermate" continue heavy, although supplies of South Carolina distributors are now exhausted and there is no encouragement that further supplies can be delivered.

NORTH CAROLINA. Blue mold appeared in North Carolina about the begining of March. So far it has been found or reported in only a few beds. Stands in the general area where the disease was reported are poor, with severe cold injury on plants from the first seedlings, and a high percentage of reseeding as a result of cold injury. Plants are still very small. A high proportion of plants smaller than usual will be subject to attack if weather conditions favor spread of the disease. "Fermate" spray or dust is being used by a sizeable percentage of growers. One county agent reported that most growers were ready to treat their beds, with about 30 to 40 cases of "Fermate" sold in one area in a single day.★★

Industry Patents

The following patents have recently been issued by the U.S. Patent Office on products and devices in the agricultural chemical field. Copies of the patents may be obtained at 25c each by addressing the U.S. Patent Office, Washington 25, D.C.

2,417,932. POTATO TREATING PROCESS. Patent granted March 25, 1947, to A. F. Kalmar, Riverside, Calif., assignor to Food Machinery Corp., San Jose, Calif. A method of treating potatoes which comprises contacting said potatoes with an aqueous solution of hypochlorite of an alkali-forming metal, and thereafter contacting said potatoes with an aqueous solution of an antichlor.

2,417,933. METHOD OF TREATING POTATOES. Patent granted March 25, 1947, to A. F. Kalmar, Riverside, Calif., assignor to Food Machinery Corp., San Jose, Calif. A method of removing black scurf from potatoes which consists in: subjecting said potatoes to the detergent action of a solution of a hypochlorite of an alkali-forming metal, and brushing said potatoes to remove black scurf in the presence of a reducing agent which reduces to inert chlorides any hypochlorite remaining on the potatoes.

2,418,544. SPREADING MACHINE. Patent granted April 8, 1947, to Rodolphe Comtois, St. Hyacinthe, Que., Can. A spreader of the character described comprising a wheeled vehicle having a frame, said frame having two spaced horizontal plates, throwing means disposed between said plates, a funnel on the upper plate, said upper plate having an opening connecting said funnel to said throwing means, boards hinged to the lateral and rear edges of said plates and coextensive with said edges, cranks mounted on said funnel adjacent to the boards hinged to said lateral edges, and cables extending from the last named boards and adapted to be wound respectively on said cranks.

2,418,652. INSECTICIDAL COMPOSITIONS. Patent granted April 8, 1947, to Kenneth E. Maxwell, Martinez, Calif., assignor to Shell Development Co., San Francisco, Calif. An insecticidal composition essentially comprising mineral oil, and insecticidal toxicant, and between about 0.01 percent and about 1.0 percent (by weight of the oil) of the malate of the condensation product of ethanol ethylene diamine and a mixture of stearic and palmitic acids, said composition being capable of forming an unstable emulsion with water.

Trade Marks Granted

428,678. Vitamin concentrate to be incorporated in poultry and livestock feed. Filed December 22, 1945, by Thompson-Hayward Co., Kansas City, Mo.

428,706. Chemical products for use in combatting insects and fungi. Filed March 14, 1946, by Monsanto Chemical Co., St. Louis, Mo.

428,726. Insecticide and herbicides. Filed April 12, 1946, by the Glidden Co., Cleveland, Ohio.

428,739. Preparation having use as an insecticide, a rodenticide, weed killer; and fumigants having uses for the aforementioned purposes. Filed April 26, 1946, by American Cyanamid & Chemical Corp., New York.

428,750. Parasiticides, namely insecticides, fungicides, and herbicides. Filed May 4, 1946, by California Spray-Chemical Corp., Richmond, Calif.

428,776. Insecticides and fungicides. Filed May 14, 1946, by General Chemical Co., New York.

428,781. Paint-on insecticides. Filed May 17, 1946, by Poweraire Corp., Chicago.

Trade Mark Applications

NUGREEN, in capital letters, for fertilizers. Filed May 21, 1946, by E. I. duPont deNemours & Co., Wilmington, Del. Claims use since April 26, 1946.

WEEDONE, in script capital letters, for chemical preparations for exterminating weeds. Filed Apr. 4, 1946, by American Chemical Paint Co., Ambler, Pa. Claims use since Aug. 10, 1944.

C-C DUST, in capital letters, for mixture of ingredients for making insecticides and fungicides. Filed July 18, 1945, by Cooperative Seed & Farm Supply Service, Inc., Richmond, Va. Claims use since Jan. 8, 1945.

WEEDIT, in upper and lower case script, for chemical weed exterminator. Filed Apr. 11, 1946, by Bay Chemical Co., Inc., Bay City, Mich. Claims use since March, 1945.

ACCOTOX, in capital letters, for insecticides. Filed May 1, 1946, by American Cyanamid & Chemical Corp., New York. Claims use since Apr. 17, 1946.

AGRITINE, in sans serif capital letters, for chemical products for use in combatting insects and fungi. Filed July 17, 1946, by Monsanto Chemical Co., St. Louis, Mo. Claims use since July 9, 1946.

ORTHO, in sans serif capital letters, for fertilizers. Filed June 28, 1946, by California Spray-Chemical Corp., Richmond, Calif. Claims use since June 3, 1946.

TRIX, in light face captial letters, for mothproofing agents, preparations for killing weeds, and destroying vermin, insecticides, fungicides and disinfectants. Filed July 2, 1946, by Geigy Co., Inc., New York. Claims use since May 29, 1946.

SANITA WEED BLITZ, the word "Sanita" in script, and "Weed Blitz" in capital letters below, for concentrated sprayable weed killer liquid. Filed June 10; 1946, by Sanita Chemical & Supply Co., Indianapolis, Ind. Claims use since Apr. 5, 1946.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 254 W. 31st St., New York 1. Closing date: 1st of month.

Position Wanted: Soil Chemist: M.Sc., 1944, available. Experienced in fertility studies, analyses of soils, water, etc. California preferred. Address Box 156 care of *Agricultural Chemicals.*

Wanted: Manufacturing organization desires to purchase small or medium size chemical manufacturing business, including plant, equipment, etc. for cash. Must be actual maker of basic chemical or chemicals, not merely mixing or minor processing. Chemicals with agricultural applications preferred, but will consider others. Buyer has highest standing in industry. Give details in confidence to Box 157 care of *Agricultural Chemicals.*

Wanted: Salesmen with experience preferably selling raw materials to paint, varnish, insecticide and other manufacturing industries, in eastern and middlewest areas. Also chemical education preferred. Good opportunity with young growing corporation. Address Box 158 care of *Agricultural Chemicals.*

Chemist: Graduate with two years experience leading manufacturer of disinfectants, cosmetics, etc. Young man desires position preferably literature research studies, new formulations, etc. Eastern location preferred. For further details, Address Box 159 care of *Agricultural Chemicals.*

Chemist Wanted: Manufacturer of basic insecticide and fungicide materials needs chemist with some experience in the field to begin in laboratory. Good opportunity for active young man. Give information education, experience, etc. in letter. Address Box 160 care of *Agricultural Chemicals.*

CONSULTING ENTOMOLOGIST

Insecticides — Formulation
Plant Pathology — Research
Entomology — Legal Service

Eighteen Years consulting work.
Thirty years technical agriculture.

DR. E. R. de ONG

926 Stannage Ave., Albany 6, Calif.

ALVIN J. COX, Ph.D.

Chemical Engineer and Chemist

(Formerly Director of Science, Government of the Philippine Islands; Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)

ADVISOR ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS

Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.

1118 Emerson Street
Palo Alto, California

DDT-Thanite Spray: Large gallonage in 5 gal. 1CC steel drums suitable for export, institution or industrial resale, 2½% Thanite, 1% DDT in deodorized oil. Grade AA spray. Priced 35-38c gal. FOB Philadelphia. Minimum quantity sale 1000 gals. Cook Industries, 189-A Schaeffer St., Brooklyn 7, N. Y.

Chemical Engineer, MS CH E 1947: Desires position in development or production work. Experience in alcohol from corn, coal tar distillates, and Inositol extractions. Married with family. Location immaterial. Address Box 161 care of *Agricultural Chemicals.*

•

Wamesit Begins Production

Production has begun at the new Wamesit Chemical Co., plant at Wamesit, Mass., according to Kenneth L. Rue, president and treasurer. The firm expects to have an annual output from 10,000 to 12,000 tons of nitrogenous tankage testing 8-10 percent ammonia content. The material will be marketed under the trade name of "Wamco Tankage." Officers of the new company, in addition to president Rue include John J. Grady, vice-president and assistant treasurer, and Lloyd E. Conn, secretary and attorney. The firm was incorporated in December, 1946.

•

Ott in New Pennsalt Job

Edwin M. Ott has been named assistant manager of market research at Pennsylvania Salt Manufacturing Co., Philadelphia, it was recently announced by the company. Mr. Ott was formerly chemical engineer of the department.

Advertisers' Index

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

TALE ENDS

Dr. R. C. Roark of the U. S. D. A. says that the progress in insecticides and fungicides and in the machinery for applying them has been so rapid that only those books published since the beginning of World War II contain up-to-date information. Dr. Roark notes further that late publications on the subject are cognizant of the fact that there are a number of insect pests against which DDT is not effective. The insecticide field is a fast-moving one, challenging all of its members to keep up with new developments.

•

Significant names department: Vice-president of the Ohio State Horticultural Society is named Ben Davis. However, his interest in horticulture is not restricted to apple production . . . the society's activities including many phases of plant culture.

•

Glenn A. Cumings, senior agricultural engineer of the U. S. Department of Agriculture, commented recently that the use of airplanes in spreading fertilizer is more likely to be a supplement to machinery commonly used, rather than a substitute for the usual methods. To date distributing fertilizer by airplane has not come into much competition with the use of conventional machines. Mr. Cummings commented, however, that "it seems reasonable to predict that airplane equipment will be more extensively used. But fertilizing from the air is likely to be under conditions which will not materially change the need for conventional machines, at least in the near future."

•

The story comes from the west that certain operators of Todd Insecticidal Fog Applicators communicate with one another by use of "smoke signals" in code. The "Tifa" fog machine can be turned on and off rapidly enough to make possible dot and dash communication.

FOR THE EXCLUSIVE USE OF INSECTICIDE MANUFACTURERS—SEE PAGE (34 .)

PYRETOX 100

■ After four years of practical unavailability we can again offer adequate quantities of PYRETOX 100 for use in the manufacture of agricultural dusts.

■ PYRETOX 100 is an impregnated pyrethrum dust base of 200 mesh fineness containing a minimum of 1% pyrethrins and mixes readily with any of the usual diluents though Pyrophyllites and talcs are preferable.

■ The advantages in effectiveness, stability, and economy of properly impregnated pyrethrum bases over pyrethrum powder have been too fully demonstrated over a period of years to require elaboration. One pound of PYRETOX 100 is roughly equivalent in effectiveness to two pounds of 1% pyrethrum powder and is much less expensive.

■ PYRETOX 100 is indicated wherever a pyrethrum dust is needed or whenever it is desired to step up the activity of DDT or other ingredients by the addition of pyrethrum.

D&O DODGE & OLCOTT, Inc.

Insecticide Division: 60 EAST 42ND STREET, NEW YORK 17, NEW YORK
General Offices: 180 VARICK STREET, NEW YORK 14, NEW YORK.
Branches: BOSTON • CHICAGO • PHILADELPHIA • ST. LOUIS • LOS ANGELES
Plant and Laboratories: BAYONNE, NEW JERSEY
Canadian Agents: STANDARD CHEMICAL COMPANY LIMITED, 195 FLEET STREET E., TORONTO, CAN.